THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXVII. No. 669.] LONDON, MARCH 7, 1876. [28TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.

The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.

RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.

GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.

Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.

Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.

GENUINE TORBAY PAINT
AND
SPECIAL GASOMETER PAINT
(Mixed ready for use).

These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.

They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.

The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.

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(SUCCESSORS TO SAMUEL CALLEY. ESTABLISHED 20 YEARS.)
21, GT. WINCHESTER ST., LONDON.
WORKS: BRIXHAM, TORBAY.

THOMAS PROUD,
MANUFACTURER OF
WOOD GRIDS
FOR
SCRUBBERS
AND
PURIFIERS.

BROOKFIELD IRON-WORKS,
103, ICKNIELD STREET EAST, BIRMINGHAM.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,

Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."

J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.

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Coal Office,
QUAY SIDE, NEWCASTLE-ON-TYNE.

JOS. COWEN & Co. are the only Manufacturers of FIRE-BRICKS and CLAY RETORTS at BLAYDON BURN.

JOHN RUSSELL AND CO.,
THE WEDNESBURY TUBE-WORKS, WEDNESBURY;
AND
THE ALMA WORKS, WALSALL.
Established at the commencement of Gas Lighting.

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69, UPPER THAMES STREET; COMMERCIAL STREET, SPITALFIELDS; 5, CHARLES STREET, SOHO; and 16, SOHO SQUARE, } LONDON
35, 36, 37, & 39, GRANBY ROW, MANCHESTER.

J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.

J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanised Tubes and High-Pressure Tubes, &c.

Lists may be obtained on application to
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JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
OF
FIRST-CLASS MATERIALS & WORKMANSHIP;
Also, STATION-METERS, PRESSURE-GAUGES, STREET-LAMPS, REGULATORS, &c.

ESTABLISHED 1830.

THOMAS PIGGOTT & CO.,
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MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
Roofs, Girders, and Bridges, and General Smith's Work.
LONDON AGENT—W. G. DAVIS, 2, Brabant Court, Philpot Lane, E.C.

J. & H. ROBUS,
CONTRACTORS
FOR THE
ERECTION OF NEW & REMODELLING OF EXISTING GAS-WORKS.

RETORT-SETTING A SPÉCIALITÉ.

RETORTS SET, AND GUARANTEED TO BURN OFF A CERTAIN AMOUNT OF COAL, OR ELSE NO MONEY TAKEN FOR THE CONTRACT.

PLANS ON APPLICATION.
Retort-Setters sent to all parts of Europe and America.
Address, J. and H. ROBUS,
BELL GREEN, CATFORD, LONDON, S.E.

THE
NITSHILL COMPANY'S
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.

AGENT:
JAMES M'KELVIE,
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EDINBURGH.

LONDON, 1862. CLASS X.
LONDON, 1862. CLASS XXXI.
PARIS, 1867. SILVER MEDAL.
AMSTERDAM, 1869.
DIPLOMA D'EXCELLENCE.
VIENNA, 1873. THE ONLY MEDAL.
MANCHESTER, 1875. SILVER MEDAL

GEORGE GLOVER & CO.,

MANUFACTURERS OF

IMPROVED DRY GAS-METERS,

WARRANTED TO MEASURE CORRECTLY, AND NOT TO VARY.

EXTENSION OF PREMISES.

G. G. & Co. having had their premises entirely rebuilt, are now fairly in possession of large and commodious workshops, specially adapted to the requirements of the trade, and they are prepared to execute orders, large or small, with promptness and despatch.

THEY KEEP IN STOCK METERS OF ALL SIZES, UP TO 300 LIGHTS.

RANELAGH WORKS, RANELAGH ROAD, PIMLICO,
LONDON, S.W.;
236, GEORGE STREET, GLASGOW; and 30, LANCASTER AVENUE, MANCHESTER
AGENT FOR AUSTRALIA:
Mr. A. DEMPSTER, POST-OFFICE PLACE, MELBOURNE.

G. G. & Co. have just been awarded a SILVER MEDAL for Gas-Meters and Gas Apparatus at the Exhibition of the "Society for the Promotion of Scientific Industry," Manchester.

SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS

AND

LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES.

Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools.

London Offices: No. 4, Cloak Lane, Queen Street, E.C.

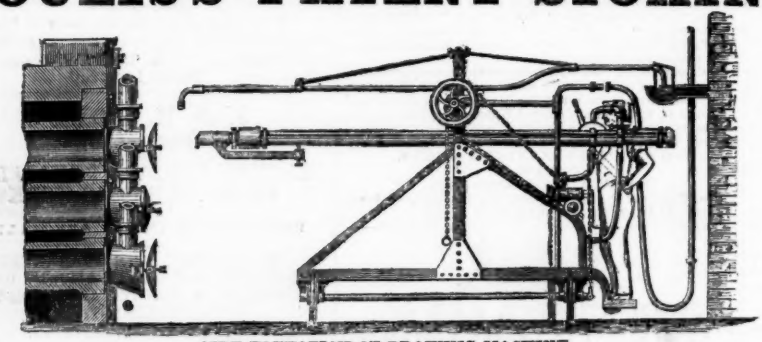
WAREHOUSES:

LONDON: 157, UPPER THAMES STREET, E.C.

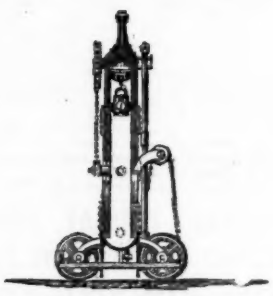
LIVERPOOL: No. 63, Paradise Street. | PARIS: No. 38, Rue du Chateau d'Eau.

MANCHESTER: Barlow's Croft, Chapel Street, Salford. | LILLE: No. 38, Rue Grande Chaussee.

FOULIS'S PATENT STOKING MACHINE.



SIDE ELEVATION OF DRAWING MACHINE.



END ELEVATION.

(*The Charging Machine will be Illustrated in next week's Advertisement.*)

Makers: TANGYE BROTHERS and HOLMAN, London and Birmingham; ADAM WOODWARD and SON, Manchester; ROBERT LAIDLAW and SON, Glasgow; MASCHINENBAU-ACTIEN-GESELLSCHAFT HUMBOLDT, Kalk bei Deutz; Or all particulars may be had from JAMES WOTHERSPOON, 31, St. Vincent Place, Glasgow.

WEST'S GAS IMPROVEMENT COMPANY,

LIMITED,

ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,

And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

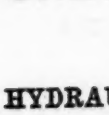
The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

The advantages attending its use are—

INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

TRADE MARK



THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.;

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

London Agent: W. G. DAVIS, 2, BRABANT COURT, PHILPOT LANE, E.C.

THE LANCASHIRE GAS-METER COMPANY,

LIMITED,

FALCON METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY GAS-METERS, GOVERNORS, PRESSURE & EXHAUST REGISTERS,

&c., &c.

STREET-LAMP METERS in CAST-IRON CASES.

LAMP COCKS AND BRASS FINISHING IN ALL ITS BRANCHES.

JOHN WRIGHT AND CO., ESSEX WORKS, BIRMINGHAM,

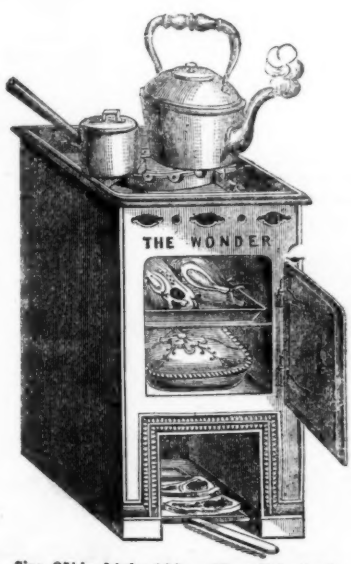
Beg to call the attention of MANAGERS and DIRECTORS of GAS COMPANIES to the following letter which they have lately received.

COPY OF LETTER RECEIVED FROM MAGNUS OHREN, Esq.

To Messrs. John Wright and Co., Essex Works, Birmingham. *Crystal Palace District Gas Company, Lower Sydenham, S.E.*

Dear Sirs,—In reply to your inquiries, I am glad to state that the use of GAS COOKING AND HEATING STOVES has been a complete success here. We have several hundred in use in our districts. We also find it advantageous to let out Stoves at a small rental. We have now 275 Stoves at rent.

The Stoves you make I can with confidence recommend, having so many in use, and giving satisfaction. I need scarcely point out to you the advantage to Gas Companies to recommend the use of Gas Stoves to their Gas Consumers, even where they do not supply them on sale or rent, as the use of Gas Stoves brings day consumption, and thus the Company make a profit by day as well as by night.—I am, dear sirs, yours faithfully, MAGNUS OHREN.



Size, 25½ in. high; 14 in. wide; 12½ in. back to front.

Price 50s., complete with Pan and Gridiron.

GAS HEATING STOVES

(TERRA COTTA AND IRON).

THE CHEERFUL STOVE.

COOKING STOVES.

BREAKFAST COOKERS.

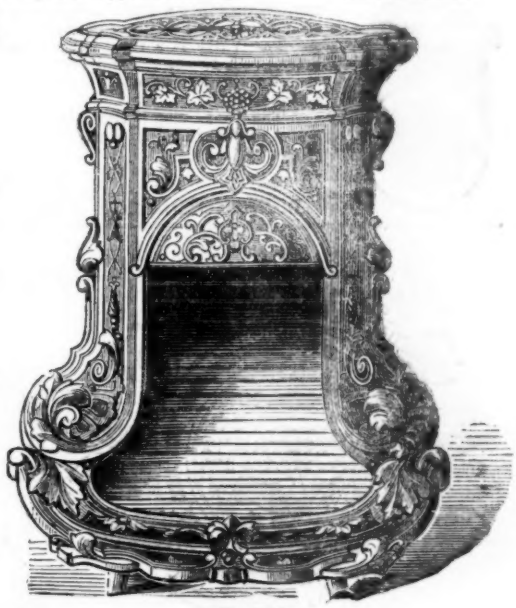
BATHS HEATED by GAS

GAS STOVES

For Boiling, Broiling, Preserving, Heating Flat Irons, and for all other Domestic Purposes.

Gas Companies and the Trade who have not our Illustrated Catalogue are respectfully requested to apply for same.

A LIBERAL DISCOUNT to the TRADE.



No. 4003.

THE CHEERFUL GAS STOVE, with Copper Reflector,

Has all the appearance of a Bright Fire.

PRICE from 32s.

THE

IMPERIAL METER COMPANY,

LIMITED,

KING'S ROAD, LONDON, N.W.,

OFFICE: 115, VICTORIA STREET, WESTMINSTER, S.W.,

MANUFACTURERS OF

"WET" & "DRY" GAS-METERS IN IRON & TIN-PLATE CASES,

STATION-METERS AND GOVERNORS, STREET-LAMP METERS, BOXES, AND REGULATORS FOR THE AVERAGE METER SYSTEM.

TO GAS COMPANIES, ENGINEERS, &c.

These Works are in full operation, and it will be the aim of the New Company not only to keep up the excellent workmanship of their predecessors, but, by the introduction of special machinery, to manufacture **Meters of a higher standard than is usually given, without increasing the cost.**

Special attention is invited to the Compensating Wet Gas-Meter of De Castro and Burton, which is now becoming so generally adopted, and is more simple in construction than any other Compensating or Ordinary Wet Meter. There is but one centre of friction to be overcome by the gas. By its self-adjusting principle it maintains an unvarying water-line; and the reservoir contains sufficient water to supply the Meter for twelve months without attention. It is unaffected by "tilting," and cannot be "flooded" by any pressure.

The Company also manufacture Dry Meters upon the most improved principle, and all their Meters being made to standard gauges, the most accurate measurement is obtained.

Attention is also called to their Dry Meters in Wood Cases, as used by some of the London Gas Companies. These Cases are a great preservation to Tin-plate Meters, especially in seaport towns, where the air is impregnated with salt; they are also particularly suited for export.

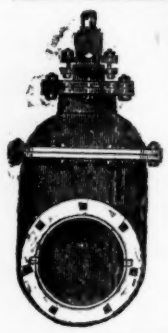
The Company repair or convert every description of Wet Gas-Meters to De Castro and Burton's Patent.

JOSEPH AIRD,

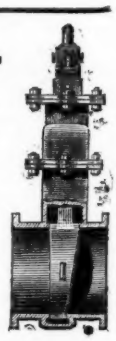
WELLINGTON TUBE-WORKS, TIPTON, STAFFORDSHIRE,

MANUFACTURER OF

EVERY DESCRIPTION OF TUBING, GAS, STEAM, HYDRAULIC TUBES AND FITTINGS,
EITHER BLACK, GALVANIZED, OR ENAMELLED HOT WATER TUBES AND FITTINGS,
CORE BARS, COILS, COCKS (IRON OR BRASS),
CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
HANDRAIL TUBINGS, IRON AND BRASS, PLAIN OR TWISTED,
TELEGRAPH TUBES OR POLES, &c., &c.



C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

Established

1795.

JOSEPH CLIFF & SON,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

MANUFACTURERS OF ALL DESCRIPTIONS OF

FIRE GOODS, and Salt-Glazed Drain-Pipes.

LONDON WHARF:

Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL—1, Back Leeds Street,

Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

WILLIAM SUGG,

GAS ENGINEER,

VINCENT WORKS, VINCENT STREET,

WESTMINSTER, S.W.

WILLIAM SUGG'S LATEST IMPROVEMENTS IN GAS-BURNERS.

The "LONDON" ARGAND BURNER, with SELF-ACTING GOVERNOR (Patent).

"Westminster" Pattern Shade, as used in the Ministers Rooms and Lobbies of the Houses of Parliament. This Burner is No. D size, and, with a consumption of 5 cubic feet per hour, gives about 2 candles more light than the Gas Referees model, called the No. 1 "London" Argand Burner.

With 5 cubic feet per hour of gas, which gives a light equal to 14·3 parliamentary sperm candles (as tested by the Sugg-Letheby Standard Burner), the ordinary Argands give only a light equal to 10 sperm candles, while the No. F Patent "London" Argand Burner gives a light equal to 18½ sperm candles, or 85 per cent. more light for the same quantity of gas consumed.

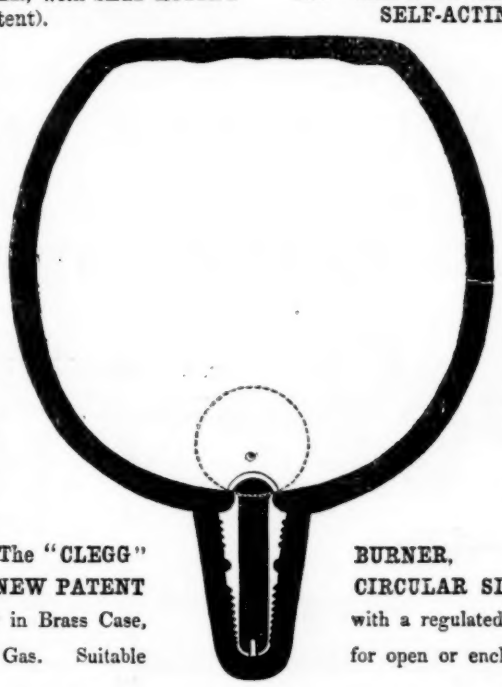
The "CHRISTIANIA" FLAT-FLAME BURNER, with SELF-ACTING GOVERNOR (Patent).

This Burner has been pronounced by the most eminent Engineers of the day to be the perfection of a flat-flame Burner.

The Shades, which are made in a beautiful white glass called Albatrine, are manufactured *exclusively* for these Burners, and cannot be obtained elsewhere.

The light emitted from this Burner is very white and soft to the eyes, and is about 30 PER CENT. superior to the ordinary fishtail.

Numerous other pattern Shades, Plain or Ornamental, may be obtained with these Burners.



The "CLEGG" BURNER, with the NEW PATENT CIRCULAR SLIT.

Is a flat-flame Burner in Brass Case, with a regulated opening for the admission of Gas. Suitable for open or enclosed Lights.

Price Lists and Prospectuses, with description of all the "London" Argand and other Burners, and their proper Shades, Supports, &c., forwarded post free on application.

LEATHER DRIVING BANDS,

Hose-Pipes and Fire-Buckets, Canvas Hose, Sponge Cloths, Cotton Waste, &c.

India-Rubber Belting, Hose, Valves, Packing, &c.
Contractors to Her Majesty Government, Railways, &c.
Price Lists on application.

STOKERS MITTS FOR GAS COMPANIES.

WILLIAM GOODWIN AND CO.,
MANUFACTURERS,
CURRIERS, AND LEATHER MERCHANTS,
36, PRIMROSE STREET, BISHOPSGATE,
LONDON, E.C.

SPENCE BROTHERS CHEMICAL COMPANY,
LIMITED.

SOLE MANUFACTURERS OF
SPENCE'S PATENT DRY COPPERAS;
CONTRACTORS FOR THE
PURIFICATION OF COAL GAS BY OXIDE OF IRON, &c.;
PURCHASERS OF
AMMONIACAL LIQUOR AND SPENT OXIDE;
MAKERS OF
OXIDE AND OTHER PAINTS;
AND
GENERAL CHEMICAL MERCHANTS.
Address: VICTORIA CHEMICAL WORKS, BRADFORD, near MANCHESTER.

HODGE & CO.'S
IMPROVED VENTILATING SUN-LIGHTS
WITH TALC REFLECTORS AND SELF-ACTING VALVES
TO PREVENT DOWN-DRAUGHT;
VENTILATING GLOBE LIGHTS for DINING-ROOMS, LIBRARIES, &c.
Ormolu, Bronze, & Crystal Gaseliers;
MEDIÆVAL CHURCH WORK AND CORONÆ
COCKS, VALVES, and FITTINGS for GAS, STEAM, and WATER;
COLUMNS, BRACKETS, & STREET LANTERNS;
BLACK AND GALVANIZED BARREL COMPO AND TIN PIPE.
GAS ENGINEERS,
100, HATTON GARDEN, LONDON.
Drawings and Prices upon application.

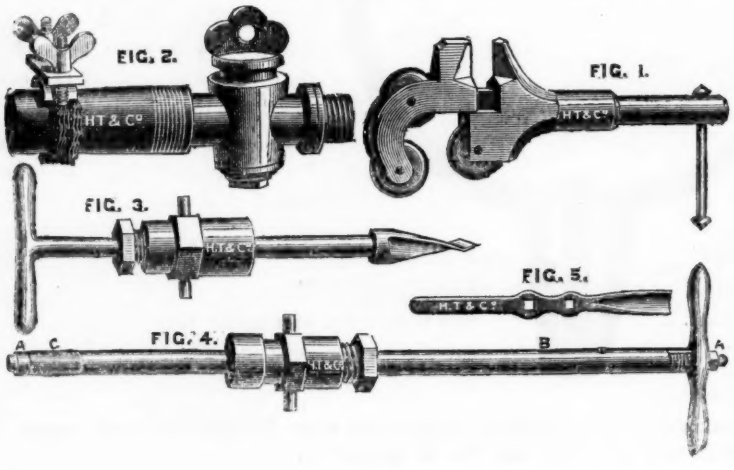
BATES'S PATENT. **No. 660. FEBRUARY, 1875.**

BATES'S PATENT APPARATUS

For Attaching Main Cocks, Valves, or other Connexions, to Service-Pipes when under Pressure.

Sole Makers and Licensees:

HAYWARD TYLER AND CO.,
HYDRAULIC AND GENERAL ENGINEERS AND BRASSFOUNDERS,
84 & 85, UPPER WHITECROSS STREET, LONDON.



PRICES.

Set of Tools for making Attachments to ¾-inch Lead Services	£3	0	0
Plug and Stuffing Box for ⅝-inch Service extra . .	0	10	0
Plug and Stuffing Box for ½-inch Service extra . .	0	10	0
Complete Set for the 3 Sizes.	4	0	0

The Prices Quoted comprise the whole Set of Tools, by the aid of which the patent process is rendered so simple that any plumber can work it after having it once explained, or reading the printed instructions. The tools are light and handy, and no trouble to carry about. The Joints can be made in any of the ordinary ways.

TANGYE BROTHERS AND HOLMAN,

LAURENCE POUNTNEY LANE, LONDON, E.C.,

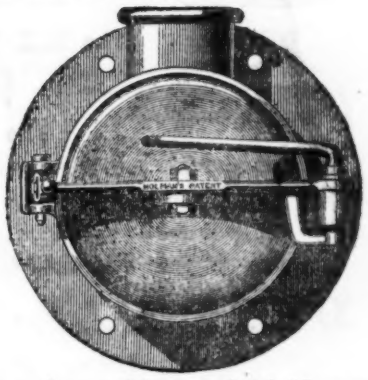
SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH

HOLMAN'S NEW PATENT BRACKETED CROSS-BARS,

Anti-Friction Catches and Eccentric Fastenings.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required. Holman's New Self-Sustaining Cross-Bar ensures freedom of joint and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested (rigid cast iron is now successfully employed), nearly 20,000 being in use at various Gas-Works in London and the Provinces, among which may be mentioned:—

The Gaslight Co., Beckton (where, by the end of 1875, nearly 4000 were in use).
" Gaslight Co., Bow Common.
" Gaslight Co., Silvertown.
" Gaslight Co., Lupus Street.
" London Gaslight Co.
" Independent do.
" Phœnix do.
" South Metropolitan Gaslight Co.
" Commercial do.
" Imperial do.
" West Ham Gas Co.
" Gas-Works, Barnet.

The Gas-Works, Royal Arsenal, [Woolwich.
" do. Lower Sydenham.
" do. Brentford.
" Consumers Gas Co., Woolwich.
" Alliance and Dublin Gas-Works.
" Edinburgh do.
" Manchester Corporation do.
" Salford do. do.
" Rochdale do. do.
" Liverpool Gas-Works.
" Birmingham do.
" Birkenhead do.
" Nottingham do.

The Newcastle-on-Tyne Gas-Works.
" Lurgan do.
" Carmarthen Gas-Works.
" Merthyr Tydfil do.
" Windsor do.
" Leeds do.
" St. Albans do.
" Over Darwen do.
" Rotherham do.
" Aylesbury do.
" Bournemouth do.
" Ystrad do.
" Cardiff do.
" Rochester do.

The Keighley Gas-Works.
" Aberdare do.
" Ballymena do.
" Richmond do.
" Stalybridge do.
" Longton do.
" Exeter do.
" Ross do.
" Falmouth do.
" Barrow-in-Furness do.
" Belfast do.
" Wakefield do.
And other Provincial and Foreign Gas-Works.

IMPORTANT TESTIMONIAL.

The Gaslight and Coke Company (Commonly called the Chartered Gas Company), Beckton, North Woolwich, July 2, 1874.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—In answer to your inquiry respecting the Self-Sealing Lids, I beg to say that they continue to work well, and I have every reason to be satisfied with them.

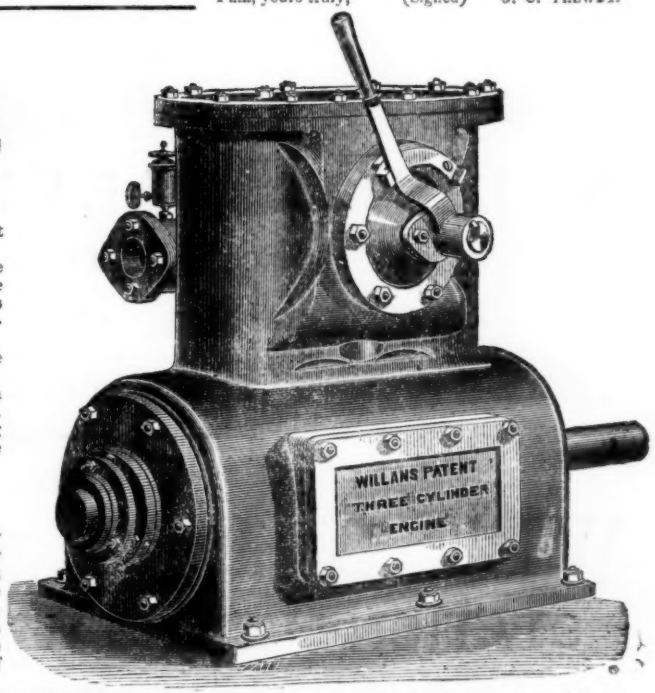
I should be very sorry to return to the old system of Luting, and our stokers here freely acknowledge the benefit to them of the new system.

I am, yours truly, (Signed) G. C. TREWBY.

WILLAN'S PATENT THREE-CYLINDER ENGINE,

ESPECIALLY SUITED TO DRIVE

GAS-EXHAUSTERS.



This Engine is exceedingly simple in construction, unlikely to get out of order, and can be safely driven by the most unskilful.

No fly-wheel is necessary, there being no "dead centre." The connecting-rods being always in compression, there is no blow on the crank-pin at either end of the stroke, and consequently the Engine is free from the knocking which is nearly always present where double-acting cylinders are used.

All the working parts, being contained in the cylinder casing, are thoroughly protected from injury by dust, &c.

The Engine occupies very much less space than is taken up by an ordinary engine doing equal work; it is also of considerably less weight.

The foundations required for it are of the simplest kind. Driving gear can be attached to either end of the crank-shaft, so that the Engine may at will be made either right or left hand.

From the "Engineer," Oct. 1, 1875.

"Although the engine is only single acting, it will do considerably more work than an ordinary double-acting engine of the same cylinder capacity. There is no thump, no matter how loose the bearings are; indeed, the whole of the bearings may be quite worn out before the working of the engine is affected. It is perfectly noiseless, and the speed at which it can be driven is very great. The working parts can be examined at a moment's notice, by removing the door at the side of the casing. These parts are very few in number, and are of the simplest description."

INDICATED HORSE POWER—At a mean steam pressure of 30 lb. per square inch.	3 H.P.	7 H.P.	15 H.P.	19 H.P.	31 H.P.	53 H.P.
Diameter of Cylinder . . . . . inches.	3	4	6	7	8	10
Length from end to end of shaft-bearings . . . . . "	18	25	36	47	49	60
Breadth . . . . . "	12	15	20	22	27	34
Height . . . . . "	19	20	29	40	42	56
Weight of Engine complete. . . . . cwt.	2½	3½	8	9	16½	31
Diameter of steam-pipe . . . . . inches.	¾	1	1¼	1½	2	2½
Price complete, with Reversing Gear	£25	£35	£55	£80	£110	£180
If fitted with Tangye's Patent Governor . . . . . EXTRA.	£6	£7 10	£9 10	£10	£12 10	£14 10

London 1851. New York, 1853 Paris, 1855. London, 1862.

Dublin, 1865 Paris, 1867.

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PATENT DRY GAS-METERS,

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THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

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THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
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Are upheld for five years without charge.

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(SUCCESSORS TO SAMUEL CROSLEY,)

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STREET-LAMP METERS,

AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

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THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 7, 1876.

Circular to Gas Companies.

We have but little to report, this week, as to the further progress made with the Regulations Bill. It is, we believe, substantially true, that a measure has been agreed to, by the Government, the two Metropolitan Authorities, and the Chartered Company, with their most recent amalgamations. The confirmation of the scheme for the last amalgamations, was, we understand, made, by the Board of Trade, contingent on the acceptance of the terms of the Bill, as now settled. They being agreed to, only one thing now stands in the way of the formal sanction by the Privy Council. The directors of the three amalgamating companies number thirty-eight. Provisions are made in the Bill for the gradual or immediate reduction of this number to fifteen, and, as a matter of course, for the compensation of the twenty-three retiring members. The amount of compensation proposed by the companies, and calculated upon a definite basis, agreed upon in the cases of previous amalgamations, is £45,000. But to this sum the authorities object, and urge, that it should be reduced to £30,000, which would give each retiring director something like £1200. This matter is now under the consideration of the Board of Trade, and when it has been decided, we understand that the scheme will be confirmed. The point is of very little importance, except to the retiring directors. The paltry difference of £15,000 will be inappreciable by the metropolitan gas consumer, and we shall be somewhat astonished if the Board of Trade object to the amount proposed by the companies.

We have, as yet, no knowledge of the course which will be pursued by the London, Phœnix, and Surrey Consumers Companies. We may say, candidly, that we do not suppose that any opposition they might raise would be successful; but we think they are bound to protest against a measure which is promoted in avowed hostility to their interests. Whatever may be said to the contrary, we all know that the main desire of the authorities is to reduce the dividends of the companies. With that object, they promoted the original Regulations Bill, with the downward sliding scale of dividend only. They have accepted the present Bill, in the fervent hope that the upward scale will never be brought into operation, except in the case of one or two companies. On our parts, we entertain a fear that, before many years are over, coal will again rise in price; and, in that event, the price of gas must rise, and dividends must go down, in the case of most companies. For the moment, it is plain sailing. The future price of gas, over the greater part of the Metropolis, may be set down, we think, at 3s. 8d. That price will allow of the payment of what we now call statutory dividends, and the formation of some considerable reserve-funds, which will be useful in years to come. It would, we think, be extremely bad policy, on the part of the older companies, to reduce the price of gas, in order to pay higher dividends. We say this, although we believe that no considerable reduction will ever be possible. It will be years before the operation of the auction clauses makes any decided impression on the capital accounts of the companies, and, in the interval, many things may happen, which need not now be speculated upon.

Until the scheme for the amalgamation of the Chartered, Imperial, and Independent Companies is confirmed, it may be as well not to discuss its provisions. When confirmed by the Privy Council, it will have, of course, all the force of an Act of Parliament, and will not be a mere agreement to amalgamate. In any case, we may presume that it would be scheduled in the Act which the Chartered Company will, we hope, presently obtain. We must, however, advise directors, who intend to retire, to look carefully to this point, for difficulties might arise as to the payment of their retiring allowances. It is urged that a simple agreement as to the terms of amalgamation, including arrangements for the compensation of retiring directors, not scheduled in the amalgamating Act, is not binding on the united company, and that, therefore, a director cannot claim the retiring allowance settled in such agreement. We do not expect that any difficulty will arise in the case of the Chartered Company; but the point had better be settled in a safe and legal manner. *Verbum sap.*

The Associated Municipal Corporations are once more making an endeavour to obtain the repeal of the Borough Funds Act, and more particularly of that part which requires the sanction of ratepayers for the expenditure of public money in promoting or opposing bills in Parliament. We have so often expressed an opinion on this question, that we need hardly enter upon it again. We look on a ratepayers meeting as a sort of committee of supply, which, in the Commons, is the whole House. It would, in our opinion, be as reasonable to leave votes of "supply" to a small select committee, as to leave the entire control of the expenditure of ratepayers money simply to the members of the local authorities. We must confess that we regret the operation of the Act in one particular instance; but no human institution in this world works perfectly, and we are satisfied that, on the whole, the operation of the Act has been beneficial to ratepayers. It gives them an opportunity of buttoning up their pockets, and we are certain that the chance is appreciated.

A ratepayers meeting at Southampton has sanctioned the expenditure of public money in opposing the Bill of the gas company. So far so good. We do not in the least object. But when we read the petition of the Corporation, already presented, we notice, that every one of the things insisted upon, has been provided for in the company's Bill. The petition is one to which, we are confident, Parliament will not listen. The committee may insert auction clauses, for evidently auction clauses will be all the rage this year. But as regards the supply of out-districts, to which the ratepayers of Southampton are much averse, we are certain that the company will carry the committee with them. The adjustment and apportionment of the capital of the company, between the borough and the outlying districts, and the keeping of separate accounts, is a manifest impossibility. It would be as reasonable, on the part of the Southampton people, to require their butcher, baker, or cheesemonger, who supplies his commodities in Hound, to charge his customers, in that district, with the expense of the horse and cart which conveys the goods. This opposition to the supply of outlying districts is continually cropping up, and is an exhibition of mere selfishness. An intelligent policy would encourage the consumption of gas to the

largest possible extent, and so bring down the general price. The petition of the Corporation is of considerable length, and we have no space for it; but, as said above, we believe that almost everything prayed for is effectually provided for in the company's Bill.

The Wigan Corporation evidently do not give satisfaction to their gas customers. One would suppose that if fairly good gas might be expected anywhere, it would be at Wigan, from the neighbourhood of which we draw much of our supply of cannel coal. But a gentleman who has examined the gas for the Pemberton Local Board, reports it as of about sixteen-candle power, and adds that in two houses, in which he examined the gas, "the old farthing "rushlight would afford an improvement, even when only in equal "numbers with the gaslights burning." It is but right to mention here, that the condition of things so described was caused by the low pressure which obtained at the time the observation was made. Something has since been done to remedy the complaints, but a member of the Pemberton Local Board still believes that they are being "swindled." The Corporation of Wigan, it is said, are about to enlarge their mains, and perhaps the supply will soon be more satisfactory. At Pemberton the gas is reported as extremely pure, but a great outcry has been raised in the borough of Wigan at the stench arising from impurities.

The Lichfield Town Council are anxious to obtain possession of the undertaking of the Lichfield Gas Company, who have no statutory powers, and the company are not indisposed to sell; but they ask for twenty-five years purchase of their annual profits, and stock to be taken at a valuation. The Corporation, on the other hand, offer twenty years purchase of the profits, agree to take stock at a valuation, and desire that each party should pay their own costs. We have no desire to hold up the case of the Lichfield Company as a "shocking example," but we must point a moral for the benefit of a great many other companies. If they had only obtained a Provisional Order, at the cost of about a hundred pounds, the Lichfield Company would have been in a position to command the twenty-five years purchase. As they are, the Corporation are dealing very liberally, in offering twenty years purchase. The terms usually settled in the case of non-statutory companies have been sixteen and two-thirds years purchase, so the bargain had better be concluded at once. The works are reported as badly situated, but in fair condition, and can be put into excellent trim for a small expenditure. The services the company have rendered were frankly acknowledged by an alderman, who expressed an opinion that, but for the gas company, the place would have been in darkness to this day. But then cathedral cities are always behind the rest of the world. The purchase will, no doubt, be a good one for the Corporation, but they must not delude themselves with the notion that they are going to borow money at four per cent.

Mr. Spice, on behalf of the gas company, has replied to the report made by Mr. G. W. Stevenson to the Ipswich Corporation. Not having published the report, we are precluded from printing the reply. We may say, however, that the alleged small production of gas, to which we did refer, receives a very satisfactory answer. Doubtless, 10,500 feet of gas may be got out of a ton of Newcastle coal; but what will be the quality? Certainly not that of the gas supplied in Ipswich. Mr. Goddard has so fully replied to the attack made on himself, that we need not again refer to that matter. The Ipswich Corporation may, of course, purchase the gas-works, if they please; but we doubt whether gas consumers would be at all the better off for the transfer. They might, as Mr. Spice suggests, be made to pay for public improvements, and, in that respect, it may be said that they would be subjected to double taxation.

Sir W. Anstruther has reintroduced his Burghs and Populous Places (Scotland) Gas Supply Bill, which deserves the serious attention of Scottish gas companies unendowed with statutory powers. Incorporated companies are pretty well protected, and the limitations proposed will, no doubt, satisfy most Corporations supplying gas. But for unincorporated companies, the Bill proposes little more than confiscation. A majority of a Town Council may, by resolution passed at one meeting, and confirmed at a second, determine to adopt the Act. Ten electors may, however, appeal to the Board of Trade. Supposing the Act adopted, the Town Council or Commissioners, or whatever the administrators of the local authority may be called, will have power to set up gas-works. If there be in the place an unincorporated gas company, the Commissioners may make an offer to purchase their undertaking; and if the company refuse to treat, or pay no attention to the notice, the local authority may appeal to the Sheriff, who may decree and declare that the authority shall have power to set up works. If there are two companies in a burgh, and one agree to sell, and the other refuse to treat, then a decree may be obtained as aforesaid; but the authority cannot exercise the power conferred, until a settlement has been made with the company who agreed to sell. The terms of purchase may be settled by agreement or arbitration. These are the provisions of the Bill which claim the attention of gas companies. It will be seen that the powers sought would practically enable local authorities to make compulsory purchases. They would also allow authorities to make a wasteful expenditure of public money on competing works, and, for these reasons, the Bill should be opposed. For the rest, we may say that the Act, if passed and adopted, will give general powers to the authorities to borrow whatever sums of money may be necessary for their special undertaking. It will compel them to supply twenty-five candle gas at a price to be fixed by annual estimate, calculated to cover all expenses in connexion with the undertaking—a provision which we regard with entire satisfaction. The production of twenty-five candle gas, however, we consider to involve a wasteful expenditure of cannel, which Scotland will, some day, have reason to regret. We must not omit to mention the "Gas Contingent Guarantee Rate," which the authority will have power to levy, if the undertaking should prove hopelessly unremunerative, the imposition of which must be an event very unlikely to happen.

The fire kindled to roast the Dublin Gas Company is being vigorously stirred, and, at the same time, pumped upon. An animated correspondence is being carried on, in the Dublin newspapers, between controversialists on both sides, and we shall only interpose on one point—the test-burner question. We may roughly estimate that the open-flame burner, forced upon the company by the Corporation, costs the Dublin consumer sixpence per 1000 feet. If Sugg's "London" burner had been adopted, the company might have saved ten out of the fifteen per cent. of cannel they are now compelled to use, and no ordinary consumer would have discovered any difference in the gas.

Water and Sanitary Notes.

It is pretty evident, that the undertaking of the Newcastle and Gateshead Water Company will soon pass into the hands of the Newcastle and Gateshead Corporations. No doubt, there will be some further haggling as to the terms; but the company, having made up their minds on the point, will, certainly, adhere to the resolution they have formed. The terms consented to by the company cannot be considered exorbitant, and the only disagreement with the authorities appears to be the rate of interest on the ordinary stock. The company want six per cent., the rate of dividend just paid; but the Corporation of Gateshead, and some members of the Corporation of Newcastle, believe that five per cent. would be enough. There are two considerations which, we think, should determine the Corporations to close the bargain at once. There is, in the first place, the rapidly increasing business of the company; and, in the next, the continual additions necessarily made to the capital account. In the course of the next two or three years, large sums will have to be added. Now, in fact, is the time for the Corporations to buy. While they are haggling over the difference of one per cent., many thousands will probably be added to capital, for which, in the end, they will, most likely, have to pay the six per cent. The matter, however, rests entirely with the Corporations, for the company have no desire to part with their property; and, with the prospects before them, may be certain of continued success.

We need hardly make further special allusion to the state of the other water companies, whose meetings we report to-day. It will be seen that most of them are somewhat harassed by local authorities. The Corporation of Dudley worry the South Staffordshire Company; the Corporation of Rochester want that which cannot possibly be provided at present—a constant supply; and even at Derby there are murmurings now, apparently because the supply is too plentiful. It seems impossible for a water company to entirely satisfy a Corporation. A *solatium* of six per cent., however, may enable shareholders to regard these incessant attacks with some equanimity.

The Bill of the Southwark and Vauxhall Water Company will be vigorously opposed, and it seems likely that, in the course of the discussions concerning it, we may learn something of the views of the Government in relation to the water supply of the Metropolis. The proceedings before the Select Committee of the Lords will possess more than usual attraction, for, in some way or other, the general interests of the Metropolitan Water Companies are certain to be assailed.

The Chemical Society has recently been exercised by the question of water analysis, and it must be admitted, that no body of men are so competent to discuss the matter. The discussion was provoked by a paper, read by Dr. Frankland, on his combustion process for determining the amount of organic matter in water. Now, as to the substantial accuracy of the results obtained by that process, when carried on by competent chemists, we have no doubt whatever. It is, however, open to a few objections on chemical grounds, which are, in some cases, of importance. Although

not difficult to execute, the process has come into only limited use, and we rather think there are but three, or, at most, four, chemists in the United Kingdom who employ it. The reason for this, no doubt, is, that it requires some rather expensive apparatus, which is only at the command of a professor connected with a public institution. Other processes necessitate but simple apparatus, and are comparatively easy of execution. But it is when we come to the inferences that he draws from the results which he obtains, that we find ourselves at hopeless variance with Dr. Frankland. When we have determined the amount of organic carbon and nitrogen in a water, what have we learnt about it? That it has been contaminated with so much sewage, says Dr. Frankland. The same question may be asked with regard to the ammonia process, and, practically, the same answer must be given. And thus we have, on both sides, a classification of waters, into safe, suspicious, and dangerous, according to the amount of organic matter they are estimated to contain. But what, in reality, do we know of the influence of the water supply on health? Take, at random, two towns in England—one, Wakefield, supplied with, perhaps, the filthiest water in the kingdom, and another, Sunderland, supplied with (as regards organic matter) the purest water in the country. Well, according to the Registrar-General's Returns, for the ten years, 1860-70, the death-rate of the two places is sensibly the same. Take the case of Birmingham, which, while it drank the diluted sewage of the Tame, was, perhaps, the healthiest of our large towns. It is now furnished with pure water from the new red sandstone, and we believe we are right in saying, that the mortality has been going up ever since the new supply was introduced. Take, again, the instances of Liverpool and Glasgow, both of them supplied with water, the quality of which is unimpeached, and yet, the two unhealthiest towns in the kingdom. These things point out, that many factors must be at work in the production of disease; and the objection we raise to the dogmatism of Dr. Frankland and the Registrar-General is, that it stops inquiry and investigation. Does an outbreak of some of the so-called zymotic diseases occur in any locality, the water is immediately pounced upon, and it is strange indeed if sufficient organic carbon and nitrogen (or even albumenoid ammonia) cannot be found to fully account for the epidemic. Nobody thinks of looking for any other cause, except it may be sewer gas, of which we know less than we do of water. We hope, in the course of time, to be able to give a report of Dr. Frankland's paper, with the answers of some of the prominent objectors to his process; and here, for the present, we leave the subject.

RAMSGATE GAS AND WATER SUPPLY.—At a meeting of the Ramsgate Local Board on the 29th ult., it was resolved, on the motion of the Rev. E. G. Banks, that an offer be made to the Isle of Thanet Gas Company, to refer the purchase of their Ramsgate and St. Lawrence works to limited arbitration, in the manner suggested by the committee appointed to negotiate for the purchase of the gas-works, in their letter to the company of the 11th of November last, and that the common seal of the board be affixed to a copy of this resolution to be sent to the company. A similar resolution to the above, with reference to the water company, was also adopted.

CHELMSFORD GAS SUPPLY.—At the monthly meeting of the local board, held on the 23rd ult.—Mr. Verley in the chair—a report was presented from the Lighting Committee, to whom it had been referred to consider the whole question of lighting the town, and the appointment of a gas inspector. It stated that the committee had considered the questions referred to them, and were of opinion that since the new governors had been in use on the public lamps, the town had been better lighted than for some considerable time previously, at a saving of one-tenth of the cost, and that they did not consider there was any occasion to make any complaint against the gas company on the matter. Mr. Meade, the manager of the gas-works, tested, in the presence of the committee, the pressure at one of the public lamps in the New London Road, when the gauge registered a pressure of gas equal to 12-10ths of an inch, being 4-10ths in excess of the parliamentary standard. The committee were also of opinion that there was no occasion to appoint an examiner to test the quality of the gas. The report of the committee was adopted, a general feeling of satisfaction with the present state of things being apparent.

MUNICIPAL CORPORATIONS (BOROUGH FUNDS) ACT.—At the annual meeting of the Municipal Corporations Association on Friday last, a discussion arose upon the proposal of a resolution, recommending the introduction into Parliament of a bill to repeal the proviso to the fourth clause of the Borough Funds Act. The proviso declares that "no expense incurred in promoting or passing any local bill through Parliament shall be charged as aforesaid (to the owners and ratepayers), unless such promotion shall have had the consent of the owners and ratepayers of the district, as declared at a public meeting." Sir J. Heron, town-clerk of Manchester, stated that the Home Secretary had admitted to a deputation which had waited on him, that he knew the proviso to be completely unworkable, but he had not offered to take any step himself to remove it. The only course, therefore, left to the Association was itself to introduce a short bill for the purpose. The motion having been seconded by the town-clerk of Bolton, Mr. Jacob Bright pointed out that the introduction of a private bill by a private member would be a perfectly hopeless undertaking, as regarded the chance of its becoming law this session. He suggested, therefore, another application to Mr. Cross, who, having admitted the proviso to be unworkable, would perhaps give them a Government night. After a short discussion the resolution was carried unanimously. The town-clerk of Bolton moved—"That, in the opinion of this Association, the attempts now being made to assess, as a separate and additional charge for income-tax, the interest upon loans raised for the purpose of water-works, gas, markets, and other such like undertakings of municipal corporations, where such interest is met by profits charged with the tax, without deduction being allowed for interest, is contrary to the spirit and intention of the Income-Tax Acts, and should be resisted." This was seconded by the town-clerk of Liverpool, and adopted.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

LXXXVI.

BUILDINGS.

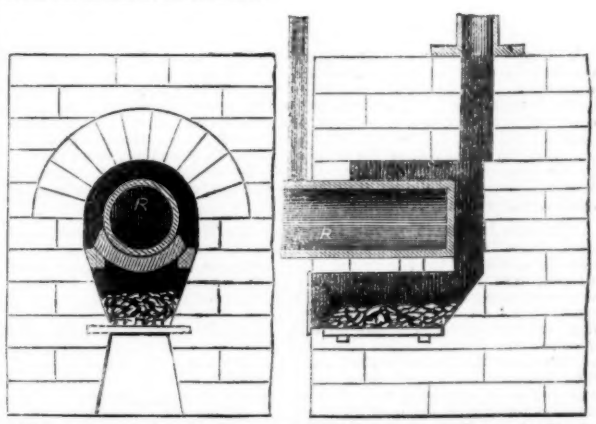
The smallest of gas-works, in a practical sense, are the experimental apparatus in use at most large establishments, as well as in many of medium capacity. These are for the purpose of experimenting on the value of coal, or other material, that may be presented to the notice of the engineer, enabling him to ascertain the quantity and quality of the gas, coke, and other residuals to be derived therefrom. He is also in a position thereby to assure himself of the varied production of gas at different temperatures, although, for this purpose, extreme care is indispensable, to prevent any variation of temperature in so small an apparatus during the operation. The experimental gas-works, although desirable in all establishments, are of absolute necessity in works situated abroad, where, at times, fresh substances are brought under the notice of the engineer, that appear suitable for gas manufacture. In fulfilling his duty to the company he represents, a proper investigation of these materials becomes necessary; and, as this cannot be carried out with the ordinary retort-settings, the apparatus in question must be applied for the purpose. In like manner, it may be desirable to make a hasty decision concerning the quality of a cargo of coals, of which a sample may be submitted to him, perhaps from a vessel lying outside the port or harbour. By means of the experimental apparatus, in the course of three hours the sample of coal may be carbonized, its illuminating power and state of purity examined, and the nature of the coke ascertained; so that, if the price of the coal be acceptable, the purchase can be effected without fear of loss.

A sample of mineral once came under our notice, which was part of a cargo for sale at a remarkably low price. It had all the appearance of coal, except that its fracture was conchoidal, similar to splint and cannel coals; but on trial it was found to be a peculiar lignite, producing, when carbonized, an incredible amount of water, giving very poor gas of limited quantity, and emitting an odour of the most repulsive nature. By the sight, it was possible to deceive many; but the experimental apparatus made known the true character of the material, which was really worthless, as the gas could not be deprived of its offensive smell.

The experimental apparatus consists of nearly all the parts essential for an ordinary gas-works—namely, retort with setting, ascension-pipe, condenser and dip-pipe, purifiers, meter, gasholder; and adjoining these is the photometer-room, with the necessary means of ascertaining the purity of the gas.

The retort used for the purpose is always of cast iron, and for the sake of simplicity of calculation is made of suitable capacity to carbonize a quantity of coal equal to the multiple of a ton, as 2·24 lbs. or the thousandth, or 22·24 lbs. or the hundreth part of a ton. Thus the quantity of gas obtained multiplied by the corresponding number, gives the production per ton.

For the information of managers of small works, we give a detailed account of an experimental apparatus which will be found suitable for their requirements. The retort is generally cylindrical, made to contain 2·24 lbs. of coal, and about 14 inches long, the mouthpiece being comprised in the measure. It is 4½ inches in diameter, and five-eighths of an inch thick, two lugs being cast at the end, to which the ears are attached. The lid is secured by screw and cross-bar in the usual manner.



The accompanying diagram represents a cross and longitudinal section of the retort in its bed, having a shield tile to protect the lower part, a piece of flange pipe forming the chimney. A 1-inch wrought-iron pipe serves as an ascension-pipe; this, at about 3 feet from the retort, is bent at right angles, and forms part of the condenser, which is made of four 1-inch pipes, each of about 6 feet long, with corresponding semi-circular bends, the whole forming a zigzag, the pipes deviating from the horizontal position in order to permit the products of condensation to pass into the receiver, which is a short piece of 1-inch pipe with tap.

Either the dry or wet lime purifier may be used; but the latter demands attention, to prevent the settlement of the lime, and on this account the former is preferable. This is composed of a wooden or tin-plate box in the form of an ordinary dry purifier, of about 15 inches square and 7 inches deep, having two tiers of wooden grids

The gasholder has a capacity of about 20 cubic feet, and not being required of the same precision as the instruments for testing meters, this, with its tank, may be manufactured by any local tinman. The holder is suspended to suitable rollers affixed to a beam and counterbalance weights. For the meter, a 5-light wet meter, with large dial, or other means to indicate the hundredth parts of a foot, will be required.

For larger works the retort should be capable of containing 22·24 pounds of coal, about 4 feet long and 8 inches diameter, all the rest of the apparatus corresponding. In setting iron retorts, even in these small apparatus, it is usual to protect the lower part from the direct action of the fire, by placing a fire-clay slab immediately underneath, as shown in the preceding diagram. With iron retorts it is absolutely necessary to leave a space at least of 3 inches (this, of course, being dependent on the length of retort) between the end of the retort and the wall, to allow of the expansion of the iron; and it must be remembered that, when expanded by a high degree of heat, it never contracts to its former length in cooling, so that at each time of heating and cooling the retort is permanently expanded in a slight degree.

Next in the order of magnitude are the gas-works employed for lighting schools, gentlemen's houses, or establishments of similar importance for gas lighting, when situated at a considerable distance from any public gas-works. The plant and operations of a work of this kind differ materially from larger establishments, where the stokers are employed continuously for the production of the necessary supply, and the various apparatus constructed proportionately.

But, for a locality like that under consideration, in which we may suppose the consumption not to exceed 120 cubic feet per night, supplying ten burners an average of four hours each, it would undoubtedly be more economical to manufacture the gas once every ten days or so, and for this purpose the holder, as well as the rest of the plant, would appear to be extravagantly large for so small a supply, and naturally the capital invested would be proportionably great. Nevertheless, there can be no doubt that this is the proper method of supplying private dwellings or other small establishments, and the economy derived by the saving of labour and fuel would be sufficient to pay a large interest on the capital invested, to say nothing of avoiding the inconvenience of making gas every second day, which is often done.

We now pass on to gas-works for supplying manufactories, where the operations are carried on with a degree of regularity similar to public gas-works, although, in most instances, only during a portion of the year. There are many manufactories, and even private business establishments, where the yearly consumption of gas is equal to that of some towns of 10,000, or even 15,000, inhabitants.

For supplying a large manufactory with gas, the principal part of the capital is invested in the apparatus, little being required for mains within the premises; and it would be supposed, from these favourable circumstances, that in such establishments the gas could be procured at a cheaper rate than supplied by the company, but such is rarely the case. This is easily explained, for it is not to be supposed that the various points of excellence in a company's works, with the engineer's experience, can be attained by the attendant in charge of a small work, who is often engaged, in the first instance, without the slightest knowledge on the subject. An instance of this kind exists, at the present moment, at a large manufactory in the eastern suburbs, in which the production of tar is at least four times greater than would be necessary with ordinarily good working; and, of course, the loss accruing can be readily understood.

(*To be continued.*)

WINCHESTER WATER AND GAS COMPANY.—The half-yearly meeting of the shareholders was held on the 23rd ult.—Mr. W. A. Lipscomb in the chair—when the accounts for the past half year were audited and passed, and a dividend declared at the rate of 7 per cent. per annum, free of income-tax. In consequence of advantageous coal contracts, and other favourable circumstances, the directors will be able, after the 1st of April, to sell gas to consumers at 4s. 9d. per 1000. In consequence of the death of Mr. W. H. Earle there was a vacancy in the directorate, and this was filled up by the election of Mr. C. M. Deane. Messrs. Lipscomb and Reeves, the outgoing directors, and Mr. W. Dowling, the auditor, were severally re-elected.

PROPOSED PURCHASE OF THE LICHFIELD GAS-WORKS.—At the meeting of the Lichfield Town Council, on the 29th ult., the committee appointed to consider the question of the purchase of the undertaking of the gas company made a report, in which they stated that the company had passed a resolution offering to transfer their property for the sum of £21,250, based on the average profits of the last five years, at 25 years purchase; to be completed by the 1st of July next, and the corporation to pay all costs. A report of Mr. Hunt, of the Birmingham Gas-Works, who had been called in to assist the committee in arriving at the value of the company's plant, stated that it was in a fair state of efficiency, the present productive power being equal to 110,000 cubic feet per day, which appeared to be somewhat more than the present greatest daily make. After carefully considering the question of the value of the works, as compared with what would be the cost of new works at present prices, they had arrived at a conclusion that, taking into consideration the immediate outlay requisite on them, and deducting a fair amount for depreciation, the works might be represented by the sum of £11,500, which was liable to be reduced according to the view taken of their unfavourable position, owing to their distance from the railway and canal. The report also pointed out that, besides the plant, the property of the company consisted of a little land and 20 houses, which were estimated at £2000, making, with Mr. Hunt's estimate, £13,500. All beyond that sum—say, up to £17,000, which the committee suggested as the whole cost of the property (subject to the verification of the company's annual profits)—must be taken to be due to the concern, as a going business, for goodwill. The report concluded by stating that it would be for the council to consider whether it would be for the public advantage to require such property, or whether the object in view—a light of more purity and greater strength, at a less cost— might not be secured by other means. After some discussion, it was resolved that the committee should proceed to negotiate with the gas company, with a view to the purchase of their plant and concern, after a verification of their profit, the price to be given being £17,000, and each party to pay its own costs.

Correspondence.

CHIMNEY SHAFTS OR STACKS.

SIR,—In corroboration of the views entertained by Mr. Methven, regarding the important subject of chimney-stacks, allow me to state that, when I had the pleasure, some months ago, of being conducted over the Manhattan Gas-Works, New York, I looked in vain for any tall sentinel, such as you described lately, and so familiar to all here, in connexion with our gas-works in this city. The fact is, they have no chimney-stack for their retort-benches, but on the top of each oven is built what might be termed a square upright flue, 2 feet 9 inches high, or thereabouts, and having an opening of about 12 inches square. On getting to the top of the benches, and walking along, I noticed that the most of these openings were partly closed by covers, showing there was plenty of draught and to spare.

These flues discharge the gaseous products of combustion from the furnaces directly into the retort-house, and a leak in any of the retorts is readily and at once detected. I offer no opinion as to the sanitary points connected with such an arrangement, but I am bound to say, that I did not notice anything disagreeable or oppressive in the atmosphere of the retort-house, and the temperature did not seem to be above what is ordinarily to be met with at home. With some kinds of fuel, this system would be impracticable, but it shows that, so far as draught is concerned, tall chimneys for retort-benches are not an absolute necessity.

My humble opinion is that we have yet much to learn regarding chimney-stacks, and a useful lesson can be got by studying the action and behaviour of the flame in different forms of paraffin lamps. We see from them that the size of wick, the height, diameter, and form of chimney, must all be in perfect proportion, and delicately adjusted to ensure perfect combustion; but we also see, by comparing the ordinary 8 or 10 inch chimney with the globular shape used in Rowatt's Anucapnic lamp, that variety of form is not incompatible with good results. So with chimney-stacks there may be variety in height and form, and yet perfect combustion obtained.

The only methodical experiments I know of, in connexion with this subject, were undertaken some years ago by Mr. Peter Carmichael, of the eminent firm of Baxter Brothers and Co., Dundee, the results being given in a paper read by him before the Institution of Engineers in Scotland, in 1865.

Mr. Carmichael's experiments led him to the belief that a tall chimney, with great taper or batter, gives the best results. His chimneys are of the obelisk form, and the three referred to in his paper are of the following proportions:—

	Height from Base to Point.	Area of Opening at Bottom.	Contracted Area of Opening at Top.
No. 1 . .	162·0 ft. . .	90·25 sq. ft. . .	25·00 sq. ft.
„ 2 . .	135·0 „ . .	49·00 „ . .	13·78 „
„ 3 . .	102·8 „ . .	18·06 „ . .	1·75 „

The work done by these chimneys seems perfect, for, while others in the neighbourhood may be seen sending out huge volumes of black smoke, it is seldom possible to see even the slightest trace of smoke from the three referred to. No. 1 chimney serves 19 boilers, each with two furnaces, and the draught varies from 0·88 to 0·55 on a water-gauge.

The question is, whether 19 dwarf chimneys would give better evaporative power from the same amount of fuel; and, if there be any analogy between an ordinary steam-boiler furnace, and that for heating gas-retorts. The American practice shows that—putting aside the nuisance of smoke or bad gases being thrown over a district by dwarf chimneys—they do not fail, so far as draught is concerned.

The subject is one of great importance, worthy of being taken up by the different Gas Managers Associations; and if members would give the height and area of their chimneys at base and top, draught (as indicated by a water-gauge), along with the quantity of fuel consumed and coal carbonized, a good notion might be got of the comparative merits of tall and dwarf chimneys.

Fountainbridge Works, Edinburgh. D. BRUCE PEEBLES.

BURNER-TESTING EXTRAORDINARY.

SIR,—Having read with much interest the various papers and correspondence on gas-burners, that have from time to time appeared in your JOURNAL, and not being satisfied with the conflicting results, which a gas engineer could no doubt easily reconcile, perhaps you will kindly allow me to ask a few questions, the answers to which may be of value to many of your readers besides myself.

1. It is well known that, in burning coke, coal, or wood, the coke gives the intensest local heat, and is therefore of greatest value in a blast furnace or cupola, but is useless to heat a kitchen oven properly, when compared with either coal or wood. Now is there not some analogy between coke and the Argand burner, which gives the intensest local light, and therefore always distances other burners in photometrical experiments, where the amount of light is measured in a horizontal plane only? The light radiated downwards from an Argand burner is, of course, intercepted greatly by the burner and its accessories, especially when a governor is attached; hence the use of shades to reflect the light downwards. But, again, these shades at once intercept the light upwards, which would otherwise be reflected from the ceiling, and diffused over a room, whence it would appear that the efficiency of the much-lauded Argands, of whatever make, is not to be measured by the photometrical results in a test-room, when considered for lighting up a dwelling-room; yet their rays can be well applied when Argands are used for lighting desks or shop windows.

2. It is well known that the intimate admixture of air with gas, which gives the intensest heat, gives also the worst light; and, generally speaking, in burning gas the greater the heat the worse the light. Now how is it that the Argand burner, which gives the intensest local light, is also said to be the most objectionable with respect to the heat it gives out? So much so, in fact, that the heat is a great barrier to its general adoption, and has been the cause of its removal in a great number of cases. And again, on the other hand, the Brönner burner and globe, which is said to give a better generally diffused light than the Argand, is also said to give off the least heat of any burner, in proportion to the quantity of gas used; and, as a proof of this, the hand can be held on the globe, after the light has been on for hours, without any inconvenience. Is there actually so much more heat in using Argand burners, or is the heat only more concentrated and local, in consequence of the confined chim-

ney area? If there is more heat, on what principle of combustion can it be explained?

No doubt the greater quantity of air passing through the Brönner globe, compared with the Argand chimney, tends to keep the former cool; but the headaches and other serious effects of the heat felt, when Argand burners are used over desks and counters, are not felt with other lights of equal power, and burning more gas. I am speaking not so much from my own actual experience, as from the results of inquiries and information gained in different parts of Europe.

3. It is well known that the three points to be considered in burning gas are, quality of gas, pressure of gas, and description of burner. Now how is it, in so many experiments one sees tried in different parts of the country, that in testing burners a given pressure is not adhered to throughout the tests, which, roughly speaking, would be the case when the burners came to be applied in a house or works, however much the pressure in the same building may vary from hour to hour after the burners are applied? For example, in the experiments made at Dundee lately, and given in your JOURNAL of the 1st of February last, Bray's No. 6 burners are tested at 3-10ths pressure, and Bray's Nos. 3 and 4 at 5-10ths pressure, whilst the iron union and iron bat's-wing burners, from Nos. 0 to 3, are tested at 14-10ths pressure. Can anything be more unfair or misleading to a non-technical audience than the experiments given in the table I am quoting from? If one thing is more evident than another to an outsider, it is that the bias, whether intentional or not, is towards Bray's burners; yet when we compare Bray's No. 1 at 10-10ths pressure with the No. 2 iron union and bat's-wing, the only cases in the table that approach fairness of comparison, although the bias is still towards the Bray's burner, the result is immensely in favour of the common iron burner—more than 70 per cent. in favour of the iron bat's-wing. Had the pressures been equal, it might have reached the absurd figure of 100 per cent. in favour of the common iron bat's-wing over Bray's burner. Moreover, the tests with Nos. 1 and 6 Bray's, and No. 1 iron union and large steatite bat's-wing, which give such good results, are virtually tests to show the inferiority of the burners used separately, and of the superiority of the throttling principle long used by Sugg, Brönner, and others.

But it is more than probable that the best photometrical results given in the account of these Dundee tests, and many others of the same kind, would have made so much smoke in ordinary draughty rooms, that the smoke coming from the light flames would have been unbearable. Therefore, may I ask, what are such tests worth, when it is attempted to deduce any rules from them for ordinary practice?

Let the amount of heat and smoke that can be tolerated in practice be decided upon first, and then select your burners and pressures to keep within these amounts, before making a test before an uninitiated audience.

There is yet another misleading circumstance in recording burner-tests—viz., a union burner, taken as consuming, say, 2·5 feet an hour, and giving, say, 6 candles light, calculated at 5 feet an hour, would give 12 candles. Now, this is only true if two of such burners are used, in order to get the 5 feet consumption; whilst it is equally true that, if the 5 feet per hour were passed through the single burner, the light, instead of increasing to 12 candles, would be more likely to dwindle to 3 or 4 candles. This is especially the case with small fishtail or tulip burners of all kinds, which soon reach their maximum efficiency with increasing consumption; and anything beyond a certain consumption simply impairs the light, and this point should be shown in tests undertaken to enlighten the public. Not being a gas engineer, I may be completely at sea in the above remarks, and any one who will kindly set me right will probably enlighten many others at the same time. R. W.

WORKING DRAWINGS OF RETORT-SETTINGS.

SIR,—Seeing a first instalment of the promised series of working drawings of retort-settings in your JOURNAL recently, I have examined them closely, with a view to the erection of two new beds in my own works this spring; and therefore I shall be much obliged if their designer will furnish me with the following additional information concerning them, viz.:—

1. Could not some means be devised of abolishing the flue L, because all the heat does not appear to me to have been utilized as much as possible, before it gets away into the chimney? I fancy it might just as well go back over the retort itself, if it could be so managed.

2. Would it not be advisable to block up the sides of the retort somewhere, as my experience tells me that, unless strengthened in some way, a clay retort will invariably fall to pieces after some time using? As it is, the retort is simply slid into its place.

3. Would a furnace 6 inches wide at the bars, 9 inches wide at the top, 12 inches high, and 2 feet long, be large enough to hold sufficient body of fire to allow a man to leave it for an hour or so, when at his other work?

4. Would not so many large tiles be expensive? I fancy the one tile over the furnace ought to be enough.

5. In the case of the setting of two retorts (fig. 6), how does the heat get along the sides of the bottom retort, as it is nearly blocked in by the piers P P, or will it get hot enough without? Would it not be better to have a 4½-inch arch to support the top one, instead of the tile, which I should think would prevent its getting much heat? Is the heat supposed to come to the front *between* the two retorts at all, or does it only come to the front along the *sides* of the top one to the opening into the lateral flue? Because, in the first case, how is it to heat the top and sides of the top retort at the back? And, in the second case, would the coal lying in the bottom of the top retort, and getting no *direct* heat, be worked off as quickly as that in the bottom one, or in the single setting?

6. Is the main arch only required one ring thick? I see that is all that is shown, and if I can safely save the usual second ring, I shall be glad to do so.

7. Can you inform me the average cost of one and two retorts set on this plan, without ironwork, but including the arches; and also the cost for renewal?

8. What per centage of the coke produced by both or either (clays only) would be required for fuel?

Answers to the above questions would be of great service to me, as well as to others under similar circumstances, as I hope to do all my repairs myself this season, and in a small work it is very necessary to be sure of the success of a system of working retorts before trying it.

Gas-Works, Bynsham. J. BROWN.

[The publication of our correspondent's letter has been unfortunately delayed, which we regret. In reply to his queries, we remark:

1. The setting is represented of the simplest as well as the most effective kind. The heat passes under the retort, and then over the retort, to near the front wall. Any more complicated system of passages would be useless.

2. With good retorts it is not desirable to block or wedge them at the sides—on the contrary; for, as first-class retorts neither expand nor contract by the heat, and as bricks do expand, by wedging, as suggested, the retort is often cracked by the very means intended to preserve it, the arch and wedge bricks both aiding.

3. Yes, if the coke were to be well piled up in the furnace.

4. The small tiles are placed at the side of the retort so as to force the heat to pass through the orifices at the end of the retort. They are very cheap.

5. The heat is communicated partly *direct* from the furnace to the upper retort, and passes in a current, as in the one retort, over the bottom and around the top retort. In a setting, as described, there will be but slight difference in the heat of the top and bottom retorts.

6. The main arch of settings up to three retorts, in a bed of 4½ inches thick, is all that is necessary, but this must, of course, be well built, with suitable arch bricks, well wetted and thin joints, laid on a proper "centre," and backed by common brickwork, for the double purpose of strength and the prevention of radiation.

7. This will depend on the size of the retort.—ED. J. G. L.]

APPOINTMENT AND REMUNERATION OF GAS COMPANIES SECRETARIES.

SIR,—I should not be surprised that "I. N. K." and "Query" may, to some extent, be both wrong in their conclusions with regard to the appointment and payment of a secretary to a joint-stock company, incorporated in and under the "Companies Clauses Consolidation Act, 1845."

I have heard the controversy, and read the correspondence in your paper, upon this business.

There is nothing whatever in the special Act to warrant the least departure from the recited Act of 1845.

The clause given in the first letter of "I. N. K.," and taken up by "Query" yesterday, is misplaced. The special Act now under consideration was obtained for what I may be pardoned for calling a "succession" company, and had, in addition to its own clauses, about thirty others purposely inserted to facilitate and render legal the winding up of the first or *old* company. Among these clauses is one which says: "It shall be lawful for the directors of [here is inserted the title of the old company] to employ such clerks and other servants as they may deem requisite . . . and to allow such salaries and remuneration as they shall think fit out of the funds which shall come into *their hands by virtue of this Act.*" It is, in fact, the clause before quoted. Just preceding the first of these thirty clauses, runs the following:—"And be it enacted that the word directors, when used in this Act with reference to [the title of the old company], shall mean the 'members of the committee of management' of the said company."

Nothing, I hold, can be more plain than that this all relates to the old company, and it is a fact which, I think, alters the argument altogether, and the case is at an end.

If there be no general notice, in the special Act, of the secretary, by his official name, it is not of the least significance. It is possible, and probable, that there is no mention made of either treasurer or auditor, and why? Because in each case the duties are well defined in the general Act. The promoters of the special Act had no motive (even if they had the power) for altering the wording and provisions so clearly set forth. The secretary's duties are also plainly set forth; but as the interpretation clause orders that the "expression" secretary shall include the word clerk, I imagine they are too numerous and varied to be all enumerated.

The assumptions raised in "Query's" letter, I think, altogether fall to the ground, when the foregoing fatal prop is removed from the support of his argument. Your insertion of this will much oblige

March 1, 1876. A CLERK.

RUABON WATER COMPANY.—The annual meeting was held on the 16th ult.—Mr. B. Davies, the vice-chairman of the company, in the chair. The report recommended a dividend of 5 per cent., leaving a good amount to be carried over to the reserve-fund. In moving the adoption of the report, the chairman said it must be a source of great satisfaction to all concerned to find that the revenue from the water-rates was steadily on the increase, and they had every reason to believe that it would go on increasing from year to year. He believed the day was not far distant when water from that company would be supplied to almost every house in the district. After many fruitless attempts on the part of some of their rivals to prove that the water supplied by that company was not so good as theirs, it was now generally acknowledged to be as good, if not better, than any in North Wales. And not only was the quality of the water good, but they had a vast quantity over and above what they required for their own district. He was also happy to state that now the works were completed, they were everything the directors could wish. The motion for the adoption of the report was carried unanimously.

WIGAN CORPORATION GAS-WORKS.—The officials connected with the gas department of the Wigan Corporation had their annual dinner on the 19th ult.—Alderman Smith presiding. After the usual loyal, patriotic, and municipal toasts, the health of the new manager, Mr. Hawkins, was proposed, and very cordially received. Mr. Hawkins, in acknowledging the compliment, said he thanked them very much for the kind way in which his health had been proposed and received. He was a stranger to them only a few days ago, but after the kindly manner they had received him, and the goodwill which had been expressed towards him that evening, he considered himself a stranger no longer. With regard to the gas-works, undoubtedly improvements were needed, but he hoped, with the assistance of those associated with him, and by his own exertions, to give a better supply of gas, and also bring a profit to the town. Some gas undertakings were worked at a loss, while others were worked at a profit; he was sorry to hear there had been a loss at Wigan in this respect. But so far as he could see, and if those engaged in the gas department would give him their help, he thought this would be altered in the future; and if, at the end of twelve months, all things being equal, he did not make good gas, and work the concern at a profit, he should not think himself fit to hold his present position. Other toasts followed, including the health of Mr. Sayer, the late manager, which was proposed in very graceful terms by Mr. Hawkins. An enjoyable meeting, the pleasure of which was much enhanced by the singing of Messrs. R. Bolton, W. Wigan, Jones, and others, was brought to a close shortly before the regulation hour.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, FEB. 28.

The LORD CHANCELLOR acquainted the House that the Standing Orders applicable to the Walsall Improvement Commissioners Gas Purchase Bill have been complied with.

Petitions against the following bills were presented:—Blackrod Gas Bill from (1) Local Board of Hindley, (2) Adlington Gas Company (Limited); Braceborough Water Bill from (1) Corporation of Peterborough, (2) Churchwardens and others in the towns and villages lying between Braceborough and Paston, (3) Francis Willis, M.D., (4) Abel Ullett; Edinburgh and District Water Bill from (1) The Duke of Buccleuch and Queensbury, (2) The Marquis of Lothian, (3) The Earl of Dalhousie, (4) Robert Dundas, (5) Messrs. Robert Craig and Sons.

TUESDAY, FEB. 29.

The Duke of RICHMOND and GORDON, in moving the second reading of the Southwark and Vauxhall Water Bill, which he did in the absence of the Chairman of Committees, begged not to be understood as giving his adhesion to the measure. He wished the bill to go before a select committee in order that there might be an inquiry into its details; but he reserved to himself the right of moving its rejection hereafter, if he should think, when it came down from the committee, that it was not a measure which ought to receive the sanction of Parliament. The bill was read a second time.

Petitions against the following bills were presented:—Blackrod Gas Bill from (1) Corporation of Wigan, (2) Blackrod and Adlington Local Boards; Llandudno Water and Gas Bill from R. O. Davies; Sutton Gas Bill from Gas consumers of Sutton and Cheam.

THURSDAY, MARCH 2.

Petitions against the following bills were presented:—Blackrod Local Board Bill from the Lord Gerard as committee of Thomas Dicconson; Llandudno Water and Gas Bill from (1) London and North-Western Railway Company, (2) Llandudno Improvement Commissioners; Southwark and Vauxhall Water Bill from Metropolitan Board of Works.

FRIDAY, MARCH 3.

Petitions against the Blackrod Gas Bill were presented from (1) Wigan Coal and Iron Company, Limited, (2, 3) Wigan Union Rural Sanitary Authority, Townships of Aspull and Haigh.

HOUSE OF COMMONS.

MONDAY, FEB. 28.

The following bills were read a second time, and committed:—British Gaslight Company (Hull Station), Cleveland Water, Ramsgate Water, Redcar and Coatham Gas, Rosstrevor Improvement, Sevenoaks Gas, Slaithwaite Gas, Stockton and Middlesbrough Corporations Water, Stockton and Middlesbrough Water, Thanet Gas, York New Water.

Report presented that Standing Order No. 75 has been complied with in the case of the Colne Valley Gas Bill. Bill to be read a second time.

A petition for an additional provision in the Dewsbury and Heckmondwike Water Bill was referred to the Examiners.

A petition against the Rosstrevor Improvement Bill was presented from the Hon. Albert Stratford George Canning.

TUESDAY, FEB. 29.

The Horncastle Gas, Southampton Gaslight and Coke, and South Metropolitan Gaslight and Coke Bills were read a second time and committed.

Report presented that Standing Order No. 74 has been complied with in the case of the Imperial Gas Bill. Bill to be read a second time.

WEDNESDAY, MARCH 1.

The Tunbridge Wells Gas Bill was read a second time, and committed.

THURSDAY, MARCH 2.

Report presented that Standing Order No. 74 has been complied with in the case of the Rossendale Union Gas Bill. Bill to be read a second time.

FRIDAY, MARCH 3.

Examiner's report on petition for additional provision in the Dewsbury and Heckmondwike Water Bill, that the Standing Orders have been complied with, presented, and instructions to the committee on the bill given, that they have power to make provision therein accordingly.

Petitions against the Stockton and Middlesbrough Corporations Water Bill were presented from (1) North-Eastern Railway Company, (2) Ironmasters, manufacturers, and others, (3) Inhabitants and water consumers of Middlesbrough and neighbourhood, (4) Ironmasters, &c., outside the boroughs of Stockton-on-Tees and Middlesbrough, (5) Stockton Local Board of Health, (6) Stockton and Hartlepool and Darlington Highway Boards and others, (7) Stockton and Middlesbrough Water-Works Company, (8) Corporation of Darlington, (9) Owners, lessees, and occupiers of lands, (10) Owners of property and consumers of water in Darlington, (11) Riparian owners on river Tees and others, (12) Normanby Local Board; and against the Spennymoor and Tudhoe Gas Bill from Robert Tindale.

Legal Intelligence.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

MONDAY, FEB. 21.

(*Sittings in Banco, before Justices* BLACKBURN, QUAIN, *and* FIELD.)

THE QUEEN, ON THE PROSECUTION OF THE LOCAL GOVERNMENT BOARD, *v.* THE CORPORATION OF LINCOLN.

Mr. GORST, Q.C., and Mr. LUMLEY were for the Board; Mr. WADDY, Q.C., and Mr. BROGDEN were for the Corporation.

This was an application on the part of the Local Government Board for a *mandamus* to compel the Corporation of Lincoln, as the Local Board, to enforce an order made by the general Board directing certain works to be executed for the drainage of the city. It appeared that, although as regards a large portion of the city, which is built on a high hill, the site offers great facilities for drainage, so as to obviate any difficulties, yet, as regards another part of the city, which is on a dead level, there are great difficulties in the drainage, and there had been some difference of judgment as to the proper course to be pursued, the consequence of which was the order made by the general Board, which it was now desired to enforce. The Corporation desired to have further time allowed, in order to enable them to obtain skilled or scientific opinion as to the proper course to be adopted.

The COURT said that there had been so much delay already, that they conceived the Corporation required the stimulus of a *mandamus*. No doubt the general Board would allow any time that was reasonable to execute the order, but there must be a *mandamus* to enforce it, and accordingly the rule was made absolute for one.

EXCHEQUER DIVISION.—MONDAY, FEB. 28.

(*Sittings in Banco, before the* LORD CHIEF BARON, *and Barons* AMPHLETT *and* HUDDLESTON.)

REG. *v.* SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.

Mr. H. MATTHEWS, Q.C. (with whom was Mr. LORD), said this was an indictment against the South Staffordshire Water-Works Company for not supplying the town of Dudley, in the county of Worcester, with pure and wholesome water, in accordance with the provisions of the Water-Works Clauses Act, to the provisions of which, the company, on the purchase of the Dudley Water-Works, had become subject. It was properly a Queen's Bench cause, which was intended to be tried at the ensuing Worcester Assizes; but, in order to save time, as that Court was not then sitting, the learned counsel asked the Court of Exchequer, under the 41st section of the Judicature Act, to deal with the matter presently in dispute. An order had been made by Justice Denman for the delivery of particulars to the water company, the defendants. The prosecution delivered certain particulars in obedience to that order, but Mr. Matthews complained, on behalf of the defendants, that these particulars were illusory. The learned counsel explained that the South Staffordshire Water-Works Company, by powers of an Act of Parliament, purchased the whole undertaking for the supply of water to the town of Dudley as far back as the year 1860. They purchased that undertaking under an Act of Parliament which incorporated the Water-Works Clauses Act, and subjected them to the operation of that statute. The 31st section of that Act provided for a sufficient supply of pure and wholesome water for the domestic use of all the inhabitants of the town and district of Dudley, and the company were now indicted for violation of that provision. The indictment, after reciting the purchase of the Dudley Water-Works, set forth that on divers days during the 15 or 16 years which had elapsed since the date of the purchase, the defendants "unlawfully did not provide" a sufficient supply of pure water for the domestic use of the inhabitants.

The LORD CHIEF BARON asked whether it was alleged that the supply was deficient in quantity as well as in quality.

Mr. MATTHEWS replied that both the quantity and the quality were complained of, and explained that Justice Denman's order for the discovery and delivery of particulars of the alleged misdemeanours was dated the 16th of February, and that the order required the delivery of particulars as to the times when, and places where, the alleged deficiencies in the water supply occurred. The particulars which had been delivered, however, Mr. Matthews contended, fell short of the requirements of that order, being too meagre and indefinite. The prosecution relied on proving that, during the years 1871 to 1875 inclusive, the borough of Dudley was insufficiently supplied, and that at various times during those six years the supply was impure and unwholesome. The prosecution relied, too, upon proving that certain persons, at certain times and in certain places, were supplied with impure water, and that the supply was insufficient in quantity. Amongst other individual cases on which the prosecution relied, he mentioned those of Mr. Joseph Stokes, of Wellington Road and Priory Street, Dudley; Mr. Stephen Hampton, of Hill Street, Netherton, and some more; but Mr. Matthews complained, on behalf of the water-works company, that specific dates were not mentioned, and that the complaints had reference to the six years only in a general way. These particulars were too vague and insufficient for a criminal case to carry a verdict of guilty in this indictment. The supply of bad water for a single hour would be sufficient.

Baron AMPHLETT observed it was only *quasi*-criminal—analogous to a nuisance.

Mr. MATTHEWS said the indictment would be satisfied if it could be shown that the company had failed, without sufficient cause, for a single half year to supply the inhabitants of Dudley with pure water in sufficient quantity; but it was necessary that specific instances, if any, should be stated, in order that the company might be prepared to show whether there was sufficient cause.

Mr. JELF, for the prosecution, opposed the application, on the ground that the question had been twice fully considered by Justice Denman, both when the defendants made their first application for an order for the delivery of particulars, and when they afterwards asked for fuller particulars. The plaintiff had supplied all the particulars he could, and had, in fact, given the defendants a great deal more information than they were entitled to demand. Justice Denman's order was for the delivery of "particulars of the alleged misdemeanours, setting out the times when, and the places where, impure and unwholesome water was alleged to have been delivered to the defendants, and particulars of the alleged failures." And it directed that, unless such particulars were delivered within a given time, all proceedings should be stayed. The application for better particulars Justice Denman refused, giving costs against the applicants.

Mr. MATTHEWS urged that as this was a criminal proceeding against the company, such vague particulars as those which had been delivered ought not to be held sufficient.

Mr. JELF said the prosecutor had given all the particulars he could give, up to the present time; and the learned counsel undertook to furnish any individual cases that could be got at, before the trial at the assizes.

The LORD CHIEF BARON said he regretted to differ from his learned brothers, but he thought the particulars insufficient, and that the order had not substantially been complied with.

Baron AMPHLETT said the object of particulars was to prevent the defendants being surprised at the trial. He thought the order had been substantially obeyed, though, at the trial, he thought the particular witnesses should be confined to the particular instances furnished, and the general to the general instances. The learned judge in chambers had expressed himself satisfied. That was not binding on them, it was true, but it would take a very strong case to make them come to a contrary conclusion.

Baron HUDDLESTON concurred. At first he thought the particulars too vague, but now he thought them ample. The indictment was for nonfeasance and malfeasance—for supplying insufficient and unwholesome water. This necessarily was in general terms, and covered a period of time. Care, however, must be taken that the prosecutors should not be tied up by technicalities, so as to make the prosecution a perfect farce, whereby the ends of justice would be defeated.

Application refused, with costs.

LAMBETH POLICE COURT.—TUESDAY, FEB. 29.

(*Before Mr.* CHANCE.)

BREACH OF CONTRACT OF SERVICE.

John Hazeldine, George Lowden, and *George Mayes*, stokers, in the service of the Phœnix Gas Company, Vauxhall, were summoned, under the Employers and Workmen Act, for absenting themselves from their work, and in each case 40s. compensation was claimed.

Mr. HALL, who appeared to prosecute, stated that the company had felt it their duty, not only on public grounds, but for their own protection, to bring the present cases before the court. Many of the men in the company's service seemed to have an impression that they could absent themselves from work just when they pleased, and it was desirable that his worship should, by his decision, show the defendants and others in similar employment, that they were bound to carry out their agreement. The printed rules of the company were posted up in the works, and distinctly showed that there was a weekly hiring and weekly notice on either side. An immense amount of inconvenience and loss would be entailed if men were permitted to leave or neglect their employment.

Evidence was then given by *Andrew Wilson*, foreman at the works at Vauxhall, showing that all three defendants had absented themselves on certain

days without permission. Their wages were £1 18s. 9d. per week. When men like defendants stopped away, it threw out the whole of the gang of men with whom they were engaged, and it was most difficult at a short notice to get others to fill the vacancies.

Mr. *Woodall*, engineer to the company, also pointed out the mischief likely to follow when the men absented themselves, and latterly there had been several cases of the kind, which had compelled the company to take the present proceedings. In one instance 70 retorts were left without hands to work them, owing to men not coming.

Mr. HALL said the amount claimed of the defendants was 40s. each, but the company had no wish to deal harshly with them, but only to let them, and others in the service, know that they were bound to attend to work. He added that every effort was made in order to lighten the work on Sundays, and this was done at very considerable expense to the company.

Mr. CHANCE said it was clear the company acted in the fairest manner possible, and as it was not desired to press the matter, he would not call upon defendants to pay the compensation. They, however, and others in the same position, must clearly understand they were liable to penalties under the Act, and if such conduct still proceeded, those penalties would certainly be enforced. It was a matter of great public importance that work of the kind should not be neglected. As the company did not press the cases, he should only order a fine of 1s. and 2s. costs in each case.

The fines were paid.

HOVE POLICE COURT.—MONDAY, FEB. 28.

(*Before Mr.* CARPENTER *and other Magistrates.*)

CONVICTION FOR INTIMIDATION AND ASSAULT AT A GAS-WORK.

Thomas Brown, a labourer at the Portslade works of the Brighton and Hove Gas Company, was charged on a summons, taken out under the 38 & 39 Vict., cap. 86, sec 7, with molesting and intimidating a youth, named Arthur Lasseter, also employed at the works.

Mr. HOWLETT, instructed by the company, attended to support the summons.

It appeared that during the week ending Saturday, the 12th ult., a movement was made among certain of the men employed at the gas-works for an increase of wages, a "round robin" being circulated, and a general turn-out of the men in question agreed upon. On the Monday following, numbers, among whom was Brown, absented themselves from work. Lasseter had been spoken to about the movement, but refused to join it, and he proceeded to his work as usual. On returning from his dinner, he was met by defendant, who, using some sanguinary threats, struck him, tore his coat off his back, pushed him into the canal, and assaulted him with an oar, telling him he did so on account of his refusing to strike.

Evidence in support of complainant's case was given by *Benjamen Seal*, foreman of the coke ground at Portslade, and a policeman, and defendant was sentenced to a month's imprisonment, with hard labour.

There was also a summons against a young fellow, named *Richardson*, for assaulting a labourer, named Edward Gander, under similar circumstances; but the evidence was not so conclusive, and the BENCH, telling defendant he had had a narrow escape, dismissed the case.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

COURT OF COMMON COUNCIL.—At the meeting of the court on Thursday last, Deputy Fry asked the chairman of the Gas Committee to inform the Court if it was true that the gas companies had withdrawn all opposition to the bill introduced by the Metropolitan Board of Works and the Corporation; and, if so, when the committee would be prepared to bring up a report to the Court informing the Court of the nature of the provisions of that bill. He also asked whether it was true that, by the arrangement acceded to, the retiring directors in the amalgamated companies were to have among them £45,000. Mr. Edmeston replied that the main points in the amalgamation bill had been settled, but there were others that had not been agreed upon. It was not anticipated that on these points there would be any objection raised by the gas companies. The committee were anxious to report as soon as they could. With regard to the question of remuneration to the directors of these companies, that was one of the points upon which the committee had raised objections, and requested the support of the Board of Trade. The number of directors was to be reduced to 15, and the outgoing members of the boards would have to receive compensation. The amount proposed was a very large sum; he forgot whether it was £45,000, but it was something like it. They were, of course, entitled to a compensation; but the committee thought £30,000 would be sufficient for the purpose. Deputy Fry: Do I understand that the initial price is fixed at 3s. 9d.? Mr. Edmeston replied in the affirmative, and the matter dropped.

METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health on the composition and quality of the metropolitan waters in February, 1876:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen.		Hardness.	
			As Nitrates, &c.	As Ammonia.	Before Boiling.	After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	22·23	0·059	0·172	0·001	15·6	4·2
West Middlesex	21·93	0·049	0·157	0·000	15·4	3·8
Southwark and Vauxhall	21·43	0·070	0·170	0·001	15·4	4·0
Chelsea	21·53	0·063	0·165	0·002	15·0	4·0
Lambeth	22·13	0·056	0·168	0·001	15·8	4·2
Other Companies.						
Kent	28·27	0·010	0·409	0·000	20·0	5·7
New River	21·60	0·041	0·174	0·000	15·4	3·9
East London	22·73	0·052	0·176	0·002	16·1	4·2

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases but the following, when it was very slightly turbid—namely, in all those of the Thames companies, excepting the West Middlesex. The average quantity of water supplied daily to the metropolis during the preceding month was, according to the returns of the water companies to the Society of Medical Officers of Health, 112,034,444 gallons; and the number of houses supplied was 523,487. This is at the rate of 32·5 gallons per head of the population daily. The last official return from Paris stated that the average daily supply per head of the population was 28·2 gallons; but this includes the water used for the public fountains, and for the ornamental waters in the Bois de Vincennes and the Bois de Boulogne.

HY. LETHEBY, M.B.

STREET WATERING.—At the Worship Street Police Court, on the 26th ult., a summons against the New River Company, taken out by the Shoreditch Vestry, came on for hearing, the point in dispute being the charge to be made to the parish by the water company for street-watering purposes. The hearing was adjourned for three weeks, to enable the magistrate to consider the points raised; after which we shall give a report of the case.

WAKEFIELD GAS COMPANY.

The Ordinary Half-Yearly Meeting of Shareholders was held on the 21st ult.—Mr. W. SLATTER in the chair.

The CHAIRMAN, in submitting the accounts for adoption, said he thought it might be well if he gave a sort of general statement as to the present position of the company. He believed the works were now in good order, a large sum of money having been expended during the half year on the fence-walls and the retort-houses. The directors had waited as long as they could, and until they got their reserve-fund into a good position, before carrying out the works, which had long been needed. An increased demand for gas had rendered it necessary for them to relay many of the mains with others of a larger size, and the pipes connected with the machinery at the works had also become too small, and 20-inch pipes had been laid in the place of 12-inch. All this had been done during the past half year, and he was glad to say that their reserve-fund was in such a state that it would bear the expenditure, and the usual dividends would not be entrenched upon. A field alongside the gas-works had been purchased for 4s. 9d. per yard, and the directors considered that the price of it (£1500) was a fair and good one, and yet not extravagant. The directors had been negotiating for the field for several years, as they considered it necessary to have it in their possession, and they thought it was worth more to them than to anybody else. Referring to the accounts, the chairman contrasted the items of receipt and expenditure with those in the corresponding half of the previous year, and explained any striking increase or decrease. Alluding to the sum of £3915 15s. 10d. paid for coals and carting, he said the quantity of coal used last half year was about 100 tons less than in the corresponding half year in 1874, and yet they had made 1½ million feet more gas. This probably arose from the fact that the coal had been of better quality, and the retorts had been kept in good order. The produce of gas during the half year from each ton of coal consumed had been 8600 feet. Not only had they made more gas in quantity, but the quality had been better than in any previous half year. They had maintained an average illuminating power of 15 candles, and that was not their statement only, but it was corroborated by the corporation tester as well. Sometimes the illuminating power of the gas had been as high as 17 candles during the half year, but, taken altogether, it had averaged 15. The company were only bound to supply gas of 12 candles illuminating power, and, therefore, the directors thought they had not only done their duty, but a little more than their duty. They had used a little more lime, for which they had paid £300 18s., and that would probably explain the increased illuminating power of the gas. The amount paid in salaries and wages was £1980 14s. 1d. This was an increase on the previous half year, for they were now paying their stokers 30s. per week. The rates and taxes amounted to £214 17s. 9d. This item varied a little in different half years, but there was not much difference this half year. The amount which was put down for tradesmen's accounts was much larger than usual, and the item would require a good deal of explanation. The station-meter had become too small for the purpose, and they had renewed it with a larger and entirely new one, at a cost of £461. They had also expended £334 in 75 new retorts, and they had paid Messrs. Spurr and Inman £218 for the ironwork for the roof of the retort-house, which had long required repairing. They had raised the roof of the retort-house eight feet and re-slated it, and the cost of the brickwork and the setting of the new retorts was £788. The re-slating cost £210, and they had also paid £523 for brickwork in the new meter-house. They had relaid the mains in Westgate, and had substituted 12-inch for 8-inch pipes. The public lamps, which had not been painted for five years, had been repainted at a cost of £27. The reduction in the price of gas by 6d. per 1000 feet had made a difference of about £1200 in their income, but still it had come up to within £300 of what it was previous to the reduction in the price. The balance of profit on the half year's transactions was £1569 8s. 10d., as against £3409 19s. 7d. in the corresponding half of the previous year. The difference was mainly accounted for by the reduction in the price of gas, and in the large amount of money expended on the works during the half year. It required £3406 17s. 9d. to pay the usual dividend of 10 per cent. to the original shareholders, and 7½ per cent. to the new shareholders, and therefore this would necessitate their taking £1837 8s. 11d. from the reserve-fund to make up the deficiency. If they had not expended the £1500, and if they had not reduced the price of gas 6d. per 1000 on the 1st of July last, their profit would have been £4269 8s. 10d. instead of £1569 8s. 10d. In reply to questions by shareholders, the chairman said the directors had charged the whole of the alterations and improvements to revenue account. The capital account had been increased by the relaying of mains. They charged the labour, the digging, and so on, to revenue, and if they took up a 4-inch main and relaid it with a main double that size, they charged the difference to capital. They proposed to lay larger mains in several places. They had already laid larger mains in Westgate, and they intended to put down a larger main from the bottom of Cheapside to the bottom of Northgate, before the new paving was commenced. They might possibly have to lay a larger main in Northgate, but they did not propose to do so at present. Alluding to what the directors proposed to do in the current half year, he said they required some additional purifiers, which would cost at least £1000, and they intended to make some improvements in the mode of exhausting, which would require one or two new boilers; therefore they would require some additional capital. At present the deficiency of capital was £1267, and therefore it would be necessary for the directors to make a call during this year to meet the expenses of the proposed work, and also to cover the cost of the £1500, which they had laid out in the purchase of the field. He did not see how they could get over this additional expense without an additional call. They could only call up £1 per share, after which, if they required more money, they must go to Parliament. During the last half year they sold 2600 tons of coke at 8s. 4d. per ton. They had 3566 customers for gas. There was one other point which it was perhaps well to mention, and that was with regard to the leakage, which was equal to 17½ per cent. The greater part of that, or, at all events, a good portion of it, arose from the public lamps. By the company's agreement with the Corporation of Wakefield, they paid for 3 feet of gas per hour for each lamp during the hours they were lighted. In order to test what quantity of gas the public lamps really consumed, the directors had four meters placed in four different parts of the town, and they had taken the average consumption. They found that instead of the lamps consuming 3 feet of gas per hour, the quantity paid for by the corporation, they consumed on the average 4½ feet, making a difference of 4 million feet of gas, and showing that the corporation were using £600 worth of gas more than they paid for.

Alderman CONNOR seconded the motion, which was put and carried.

The CHAIRMAN then moved the payment of the usual dividend of 10 per cent. on the original shares, and 7½ per cent. on the new shares, clear of income-tax, on the 1st of March. He again explained that as it would requir £3406 17s. 9d. to pay the dividends, and the balance of the half year's profit was only £1569 8s. 10d., it would render it necessary for them to take £1837 8s. 11d, from the reserve-fund. They would still have a very handsome reserve-fund, as the amount of it, after taking off the £1837 8s. 11d., would be £9300.

Mr. MOORHOUSE seconded the motion, which was carried.

The meeting closed with votes of thanks to the directors and chairman.

READING GAS COMPANY.

The Half-Yearly Meeting of Shareholders was held on the 21st ult., when the following Report of the Directors was presented:—

The directors beg to present to the shareholders the statements of account and balance-sheet for the half year ended the 31st of December, 1875, and at the same time to recommend that full dividends be paid on the 1st of March next, on all the stocks and shares of the company, in accordance with the scheme set out in dividend account.

The work of telescoping the gasholder at King's Road station, which was in progress at the time of the last half-yearly meeting of shareholders, has been accomplished under the able management of Mr. Baker, the company's engineer. The new lift was not completed before it was needed; the greatly increased quantity of gas sent out this winter could not have been distributed from the gasholder with its previous limited capacity.

Your directors, as announced, proceeded in the month of September last to sell by auction the 260 £10 seven per cent. shares, and from the prices realized they were gratified to find that the confidence of the public in the stability of the company is undiminished.

Your directors find that in order to keep pace with the still increasing business of the company, a further addition to plant is urgently required; purifiers and a station meter, of increased capacities, are indispensably necessary. Estimates and resolutions in relation to these, and to raising the requisite capital, will be laid before the meeting of shareholders.

The directors retiring by rotation are Messrs. Cooper, Taylor, and Sir Peter Spokes. These gentlemen are eligible, and offer themselves for re-election.

The retiring auditor is Mr. John Wilder. The directors regret much that (as Mr. Wilder does not seek re-election) the company will lose his services as auditor, the duties of which office he has so satisfactorily filled ever since the incorporation of the company. It will be for the meeting to appoint a successor to Mr. Wilder.

Dr. — *Profit and Loss Account, Dec. 31, 1875.* — *Cr.*

Coals consumed	£6,230	0	7	Gas-rental	£10,712	14	10
Purifying materials	87	18	3	Coke	1,904	15	6
Meters	185	19	2	Tar and ammoniacal liquor	1,158	18	8
Fittings	85	12	4	Rents of tenements	8	3	5
Materials	561	6	7				
Contingency-fund	358	6	8				
Wages	2,111	9	1				
Salaries, &c.	756	7	3				
Tradesmen's bills	306	9	5				
Rates, taxes, &c.	487	3	8				
Interest	245	13	11				
Bad debts and allowances	39	1	10				
Miscellaneous	133	12	5				
Balance	2,195	11	3				
	£13,784	12	5		£13,784	12	5

Balance-Sheet.

Share capital paid up	£62,000	0	0	Cost of plant, &c.	£75,932	16	7
Mortgage debt	11,000	0	0	Amount due for light	7,762	2	2
Premiums on shares	4,315	5	0	Coke	1,138	2	3
Debts due to sundries, viz.:				Tar and ammoniacal liquor	896	7	1
Coal	2,229	13	6	Fittings	95	18	9
Coke	16	2	0	Purifying materials	60	18	9
Tar	2	3	9	Stock on hand—			
Purifying materials	30	1	6	Tar and ammoniacal liquor	253	19	6
Meters	0	10	11	Purifying materials	165	0	0
Fittings	45	7	10	Coals	1,455	5	1
Wages	2	15	0	Coke	57	10	0
Materials	109	6	11	Meters	105	11	3
Tradesmen's bills	161	14	0	Fittings	120	0	0
Rates, taxes, &c.	493	4	6	Materials	724	5	0
Barge account	22	6	0	Office furniture	40	0	0
Salaries, &c.	170	14	8	Petty cash in hand	65	0	0
Miscellaneous	45	8	0	Balance, contingency-fund	50	18	9
Unclaimed dividends	94	8	9	Ditto in banker's hands	1,492	0	4
Reserve-fund, £3000, and dividends accrued thereon, invested in £3590 18s. 9d., New Three per Cent. Stock.				Ditto, dividend account	50	3	0
Ditto, dividends received to be invested	160	5	0				
Balance brought from last account—dividend account	7,371	0	8				
Profit and loss account	2,195	11	3				
	£90,465	19	3		£90,465	19	3

WOLVERHAMPTON GAS COMPANY.

The Half-Yearly Meeting of Shareholders was held on the 29th ult.—Mr. J. UNDERHILL in the chair.

The SECRETARY (Mr. A. Jones) read the following report of the directors:—

Your directors beg to lay before you their forty-eighth half-yearly balance-sheet and statement of accounts, duly certified by your auditor, showing the revenue for the half year ending Dec. 31, 1875, to be £25,047 8s. 7d., and the expenditure £19,326 17s. 7d., leaving a balance of £5720 11s., from which your directors recommend the payment of the usual 5 per cent. dividend forthwith, if approved by the meeting.

Your directors also inform you that the Board of Trade having granted powers to raise additional capital, not exceeding £49,480, by the creation of 6 per cent. new preference shares, the same has been done and issued to the shareholders, and the first call of £1 per share was due on the 1st of January last.

At this meeting three of your directors, Messrs. H. Ward, T. Wood, and S. Loveridge, retire by rotation, but are eligible for re-election, and offer themselves accordingly. Your auditor, Mr. Benjamin Smith, also retires, but offers himself for re-election.

In conclusion, your directors beg to assure you of their constant aim to promote the interests, both of the proprietors and the public at large.

Dr. — *Profit and Loss Account.* — *Cr.*

Cost of coal, lime, and working process	£15,069	18	7	Balance of last year	£3,838	11	4
Salaries, directors remuneration, incidental & professional chrgs.	971	10	5	Ditto from reserve-fund	1,109	8	8
Cost of lighting and extinguishing lamps, &c.	678	19	10	Gas-rents	17,369	0	5
Cost of service-pipes, retorts, repairs, and maintenance of mains, &c.	1,003	17	4	Coke, tar, liquor, and fittings	7,561	8	7
Rates, taxes, and rent of premises	1,372	12	6	Discounts	36	19	7
Dividends paid Aug. 31, 1875	4,948	0	0				
Interest	149	18	11				
Balance	5,720	11	0				
	£29,915	8	7		£29,915	8	7

The CHAIRMAN, in moving the adoption of the report, said he had very few observations to make upon the report or the business of the company, and they might be sure, when that was the case, that there was nothing very wrong. The demand for gas throughout the past year had been very good, and showed a very considerable increase upon that of any previous year. Although he regretted that they had not been quite able to make their usual dividend for the past half year, still something like £772 11s. would be carried forward to the reserve-fund, as against £1100 which was taken from it during the previous half year. That, however, did not arise from any deficiency in the supply of gas, but chiefly from the fact that the directors were obliged to make contracts for coal a considerable time before it was required for use, in order to ensure a supply during the winter months, so that there should be no failure in the supply of gas. The increased cost of coal was owing to the late high prices, whilst the prices of coke had, from flatness of trade, not been so good. However, he thought they would be able in the future to repay to the reserve-fund what had been taken from it. He would also call their attention to another fact—viz, that, notwithstanding the high price of coal for the last two or three years, there had not been any advance in the price of their gas, and he thought in this matter they would compare very favourably with the other companies throughout the country. The directors preferred to take something from the reserve-fund to make up the dividends, rather than increase the price of gas. The directors had, as stated in their report, during the past year obtained from the Board of Trade a Provisional Order, empowering them to raise additional capital not exceeding £49,480, or something like one-half their present capital. That additional capital had been offered and issued to the shareholders, and £1 per share had been called up. The directors found that the demand for gas had increased at a much more rapid rate than they had expected, and therefore it had become their duty to make such provision for the future as would enable them to meet the demand made upon them. They were taking steps to make erections for the additional storeage of gas, and also for additional retorts for the manufacture of gas; considerable additions were also being made to the mains, in order to ensure as good a supply of gas as possible. He thought, in the course of a short time, they would be able to meet any demands that might be made upon them. After observing that the profit on the past half year's business amounted to £5720 11s., out of which £4948 would be required for dividends, and the sum of £772 11s. carried to the reserve-fund, he moved the adoption of the report and the statement of accounts.

Mr. SAVAGE, sen., seconded the motion.

Mr. FLEMING said he supposed the directors were prepared to improve the quality of the gas in the more distant parts of their district. The residents of Pennfields, and also Newbridge, had suffered very much from the defective supply, and also the inferior quality of the gas.

The CHAIRMAN replied that the new works which the directors, under the advice of the engineer, proposed to carry out would meet the supply required in the future.

Major LOVERIDGE said many cases of the defective supply of gas were due to the fittings and other things belonging to the particular localities.

The CHAIRMAN stated that Major Loveridge had given a correct idea of a great many cases of complaint, but the increased demand had been so considerable—even more than they could have reasonably expected—that it had, in some measure, taken the engineer by surprise, and that was why they proposed to extend their new works to meet the demand in future, and so prevent further complaints. In reply to Mr. Blackburn, the chairman said there were a certain number of new shares which had not been taken up, and there were also some odd ones that were available for the purposes of the company. They were advised by their solicitor to sell them at the best price they could get, and let the premiums go for the benefit of the general shareholders.

The motion was then put, and carried unanimously.

The CHAIRMAN next moved the declaration of the 5 per cent. dividend recommended in the report.

Mr. IRONMONGER seconded the motion, which was carried.

The retiring directors, Messrs. H. Ward, Thomas Wood, and S. Loveridge, and the retiring auditor, Mr. B. Smith, were severally re-elected, and a cordial vote of thanks was given to the chairman and the directors for their services to the company.

The CHAIRMAN responded, and said the directors would always endeavour to promote the interests of the company.

Major LOVERIDGE then proposed a vote of thanks to Mr. Annan, the manager, and the other officers of the company, and remarked upon the assiduousness of Mr. Annan in the discharge of his duties.

Mr. UNDERHILL seconded the motion, and the CHAIRMAN bore his testimony to the zealous manner in which Mr. Annan looked after the business of the company.

The motion having been put and carried,

Mr. ANNAN thanked the meeting for the kindness shown to himself and his brother officers, and said he had been materially helped by the directors in the discharge of his duties. He might say that it was proposed to put down large mains expressly for the Pennfields district, which he hoped would prevent any complaints in the future.

The proceedings then terminated.

SOUTH SHIELDS GAS COMPANY.

The Annual Meeting of this Company was held on Monday, Feb. 28—Mr. R. WALLIS, J.P., in the chair.

The following report was presented:—

It is gratifying to your directors, in presenting their annual report, along with the balance-sheet and accounts for the half year ending Dec. 31, to assure you of the continued prosperity of the company. Notwithstanding the depression of trade at Jarrow, and, consequently, the diminished consumption of gas, the great increase of new consumers in the borough of Shields enables your directors to recommend the usual dividends of 4½ per cent. on the old, and 3½ per cent. on the new capital of the company. The new works at Jarrow are now in a position, in case of emergency, to supplement the Shields works, and before the next winter your directors expect they will be in full operation. The illuminating power of the gas has been kept up to the standard required by Act of Parliament. Your directors have to report the death of your late secretary, Mr. J. W. Lawson, who was a most faithful and trustworthy servant. They have appointed Mr. J. H. Penney, *pro tem.*, and they have every reason to be satisfied with the manner in which he transacts the business of the company; they, therefore, recommend him to the shareholders for permanent appointment.

The CHAIRMAN moved the adoption of the report and accounts, and in so doing remarked that the company were in a sound and prosperous condition. The new works at Jarrow, when completed, would manufacture more than double the quantity of the gas produced at the present works. Coal gas was now used not only for lighting purposes, but for heating, cooking, and for driving small steam-engines; and he had no doubt that, when these works were fully completed, they would be able to supply any demands required of them. The extended works would also give them manufacturing power sufficient to serve them for at least six or seven years. During the past half year there had been a very large increase in the South Shields district, in consequence of which they had only a small balance to spare. They had also had a very large saving in gas unaccounted for. In the last quarter of the past year they had 2 per cent. less than they ever had before, and 8 per cent. less than the previous quarter. Upon the whole year, however, the saving under this head was not very great, but there was still considerable reason to think they would effect further saving in that direction. They were still going on relaying the mains, and the engineer's attention would be immediately given to those in the Market Place. The meter question was a very important one. They had 4360 meters in us, and their engineer (Mr. Warner) had invented a new gas-meter. They had both dry and wet meters in use at present, and though the public favoured the dry, the directors had generally given preference to the wet meter. They had experiments made on 200 meters, both wet and dry—some of which registered very largely against the consumers, and others against the company; but the results of these experiments showed a loss to the company of 5½ per cent. They had entered into a contract with Messrs. W. and B. Cowan to thoroughly overhaul the whole of their meters, and although the cost would be a serious item in the current year's account, they hoped to be repaid in the saving effected. As new meters were wanted, they intended to adopt Warner and Cowan's wet meter, which the directors had every reason to think would be an efficient instrument, and that they would save a very considerable sum of money. For the completion of the Jarrow works, it would be necessary to make further calls, but of this notice would be given.

Mr. NELSON seconded the resolution, which was carried.

Mr. ANDERSON proposed the payment of a dividend of 4½ per cent. on the old

capital, and of 3½ per cent. on the new capital of the company, payable by warrant on the company's bankers on the 7th of March.

Mr. FAIRBAIRN seconded the motion, which was agreed to unanimously.

Upon the motion of Mr. J. L. HALL, seconded by Mr. J. RIDLEY, the following resolution was carried—namely, "That the first issue of 2000 new £10 shares, under Act of 1867 (now fully paid up), be converted into B stock, in accordance with 8 Vic., cap. 16, sec. 61."

The CHAIRMAN said there would be the appointment of a secretary to make. They all knew very well what a very efficient servant they had in Mr. Lawson, their late secretary. Mr. J. H. Penney (the acting secretary) had been amongst them for 10 years, and he had always conducted himself most creditably. He had the confidence of the directors, and they had taken it upon them to recommend him to the shareholders for appointment; and if it was their pleasure to elect him, he (the chairman) was quite certain they would have an able and valuable servant.

Mr. NELSON seconded the resolution, and it was unanimously carried.

Mr. PENNEY having thanked the shareholders for his election, and a vote of thanks having been accorded to the chairman for presiding, the meeting terminated.

BRISTOL UNITED GASLIGHT COMPANY.

An Extraordinary Meeting of Shareholders was held on the 1st inst., to consider a "bill to authorize the Bristol United Gaslight Company to purchase additional lands, and erect works for the manufacture and storeage of gas and residual products thereon, and to construct two bridges across Avon Street; amendment of Acts." Mr. F. TERRELL, the chairman of the board of directors, presided.

The SECRETARY (Mr. H. H. Townsend) having read the notice convening the meeting,

The CHAIRMAN said the shareholders had been called together to sanction a bill to enable the company to purchase additional land, and erect works for the manufacture and storeage of gas and residual products, and to construct bridges across Avon Street. The directors had been compelled, he might say, to adopt the course which they brought before the proprietors that day. It was not from any falling off in the concern; it was in consequence of their business increasing so constantly, and with such regularity as it had done for some three or four years, that they found that their present works were not able, or would not be able in the course of three or four years, to provide the city with the amount of gas that was required by it, and which the company were bound to provide, by an agreement with the city and with the public generally. The directors intended to purchase additional lands for the erection of works for the manufacture of gas, in order, not that they might go further afield after it was manufactured, but solely as a help to the present works. He trusted that the board would have the confidence of the proprietors in this matter. They had thoroughly well considered the matter, and it had not been done in a hurry, but after due deliberation, and the selection of the best place they could find for the works. When land was about to be purchased, perhaps it was not as well that it should be published in the street what quantity of land might be required, and where the land might be required to be situated; but if the shareholders would trust the board as they had always done, the directors could only say they would adopt the principle they had always acted upon—of providing, as cheaply as they could, the best means for the manufacture of gas, in order that the citizens might not grumble with them on that score. The citizens grumbled with them on almost every score; whether gas was cheap or dear, they found it very much the same, and they did not get as good words from the citizens as he thought they deserved. He concluded by expressing a hope that the shareholders would support the directors in their endeavour to obtain this bill.

Mr. ALFRED BRITTAN (the solicitor to the company) then read the bill.

The CHAIRMAN moved that the bill be approved, and the directors authorized to proceed with the same, subject to such alterations as Parliament might think fit to make therein and the directors approve. He assured the meeting that the directors would watch the bill carefully.

Mr. ISAAC RIDDLE seconded the motion, and it was carried *nem. con.*

The proceedings then terminated.

CANTERBURY GAS AND WATER COMPANY.

The Half-Yearly General Meeting of this Company was held on Friday, Feb. 21—Mr. G. FURLEY in the chair.

The SECRETARY (Mr. J. Burch) having read the notice convening the meeting, the following report was taken as read:—

The directors have the pleasure of submitting to the shareholders the statement of accounts and balance-sheet for the half year ending Dec. 31 last. The balance standing to the credit of profit and loss account is £3590 18s. 1d., and your directors are pleased in being able again to recommend a dividend at the rate of 8 per cent. per annum for the half year. The works, both gas and water, are in good working condition. The new engine erected at the water-works by Messrs. Tannelt, Walker, and Co., of Leeds, is doing its work in a satisfactory manner, and a considerable saving in fuel has, by the improvement introduced, been effected. The attention which your directors have given to the gas-mains and other distributory plant of the gas-works, has been attended with signal success, by reducing the leakage to a small amount.

The CHAIRMAN said, as would be seen, the report was a very short one, and he hoped it was a sweet one to the shareholders. They had reached a state that, with a fair working plant, and with improving rental, the receipts were coming in in a satisfactory way. A dividend of 8 per cent. was recommended, and he thought it was a very fair dividend for those shareholders who had taken an interest in the company. When they had required money to improve the company, they had always found persons ready to help them, and he was very pleased to think that those who had taken a commercial interest in the matter had received the full dividend as allowed by the Act of Parliament. It would be seen that the profit made was £3590 18s. 1d., and out of that a dividend of 8 per cent., and the interest on mortgages was to be paid. The decrease in the leakage was one of the most important things that contributed to the satisfactory dividend. It had now been reduced to 7½ per cent. Another thing must be satisfactory, and that was at a sale lately a gas and water stock of £100 fetched £135, which would show the view the outside public took of their property. He had nothing more to say because everything spoke for itself, and he should move that the report and balance-sheet be adopted, and that the same be entered in the minutes.

Mr. P. MARTEN seconded the resolution, which was put, and carried unanimously.

The CHAIRMAN proposed, and Mr. HART seconded, the motion for the dividend as recommended in the report. This was also agreed to, as were also the proposals for the re-election of the retiring directors and auditor.

Mr. COZENS moved that the best thanks be given to the directors, the officers, and the servants, for their services during the past year.

Mr. DOBELL seconded, and it was unanimously adopted.

The CHAIRMAN returned thanks, and said that it was not the directors only who brought about the satisfactory state of the company, but it was in great part due to the exertions of their secretary and the other officers of the company.

FATAL ACCIDENT AT THE READING GAS-WORKS.—A young man named Spratley was killed at these works on the 26th ult. He had been engaged in shovelling oxide down a shoot in one of the sheds, and, losing his balance, fell a distance of some 12 feet through the hole in the floor on to the flags below, fracturing his skull.

ROCHESTER AND CHATHAM WATER-WORKS COMPANY.

The Half-Yearly Meeting was held on Tuesday, the 15th ult.—Mr. J. BAIRD in the chair.

The SECRETARY read the following report:—

In presenting the balance-sheet and accounts for the half year ended Dec. 31, 1875, the directors congratulate the shareholders upon the highly satisfactory condition of the company, and the continued improvements in its prospects. The receipts for the year 1875 amounted to £699 8s. 2d. over those of the previous year; the reserve-fund now amounts to £4662 8s. 3d., and, by the addition of £300 proposed to be carried to it, will, with the half year's interest on Consols, received since making up the accounts, raise that fund to nearly £5000. The directors, therefore, feel warranted in now recommending that a dividend at the rate of £7 per cent. per annum (free from income-tax) be declared upon all shares which have been fully paid up, on the calls due in respect of such shares, prior to the 31st of December last, in proportion to the length of time which such shares or calls have been paid respectively, and that such dividends be payable on the 20th of March next. The directors also recommend that the sum of £300 be taken from the balance profits and added to the reserve-fund for contingencies, and that the balance of the reserve account be carried forward to the next half year's account. The work of deepening the wells and making new headings at a lower level at the company's works at Luton, to obtain an increased supply of water, is still going on, but owing to the severe winterly weather and the great quantity of water which rapidly accumulates in the wells, notwithstanding the incessant pumping with the auxiliary engines; and other difficulties, there has not been so much progress made as was expected, and it will yet take some considerable time before the first section of the headings can be completed. During the past six months the directors have at various times, as they were able, given a constant supply, but they still find that while the new works are in hand it is quite impossible to revert permanently to the constant service. The directors have every reason to believe that a very large additional quantity of water will be obtained when the whole of the proposed new headings are made, and which they hope will enable the company to satisfy all reasonable demands.

The CHAIRMAN said it would be seen the directors recommended the payment of an additional 1 per cent. dividend, and besides that the sum of £800, as preliminary expenses and charges had been paid off. With £1 premium on the new shares issued by the directors, the reserve-fund now stood at nearly £5000. The reserve-fund was growing rapidly, and he should like to see it still further increased. The company had paid £13,600 in dividends, and for the last 12 years had had a dividend of 6 per cent. In a short time he hoped there would be a largely increased supply of water available, and every effort was being used to push forward the works now in progress. In carrying out the works they had had great difficulties to contend with, and they had now excavated 75 feet below the level of the water. With regard to the complaints made by the corporation, that body had been told over and over again that it was quite impossible to give a constant supply of water while the works were in progress, but the company were anxious to resume the constant supply as soon as they possibly could. Complaints had been made as to an alleged insufficiency of water at fires, but there was always plenty of water in the mains to supply the fire-engines; there was, therefore, nothing to blame the company for, as it was the duty of the various public bodies to provide the proper appliances for extinguishing fires. They had supplied the Government works from their formation, and that was one of the strong arguments used in favour of the company's bill when it was before Parliament. He then moved the adoption of the report and balance-sheet.

Alderman FOORD urged upon the directors the importance of reverting to the constant service supply as soon as possible, for, apart from other considerations, he believed it to be the truest economy to do so. The company, when being formed, went to the public and obtained their support on the ground that there should be a constant supply, and the directors had repeatedly pledged themselves to this. There were besides various sanitary reasons to be urged in favour of the directors resuming the continuous supply without delay.

The CHAIRMAN said it was both unjust and ungenerous, and altogether too bad to charge the directors with not wishing to give the constant supply after the explanations they had given. The delay in their doing so had arisen solely from causes beyond their control, but as soon as ever the directors could do so they would again resume the constant service supply. He would not pledge himself to any time—whether it would bein twelve months, or in two years; but it should be done at the earliest possible period.

The report and balance-sheet were then unanimously adopted, and a dividend, at the rate of 7 per cent. per annum, for the half year, agreed to, the further sum of £300 being added to the reserve-fund.

The three retiring directors, Messrs. Baird, Withecomb, and Watts, were unanimously re-elected, as was also Mr. G. Bolton, the retiring auditor.

Votes of thanks to the directors, and to the officials of the company, having been passed, the meeting terminated.

SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held on Thursday, the 24th of February—Mr. F. JAMES in the chair.

The following report was taken as read:—

Your directors have much pleasure in submitting the accompanying statement of accounts for the half year ending the 31st of December, 1875. After providing for interest on loans and preference shares, the amount remaining (including the balance brought from last half year) is £9652 7s. 7d., and your directors recommend the declaration of a dividend for the half year at the rate of 6 per cent. per annum, less income-tax, on the paid-up ordinary shares; and a dividend at the same rate per cent. per annum on the £2 deposit paid on the ordinary shares not yet fully paid up, in accordance with the conditions under which those shares were allotted. The amount of this dividend will be £4538 2s. 3d., and there will remain a balance of £5114 5s. 4d. to the credit of future half years. The new ordinary shares created at the last meeting have all been allotted. The new works have been commenced, and are fairly advanced—several of the contracts having been let, and the others being on the point of settlement. The anticipations of your directors as to the new sources of supply have been abundantly justified. The number of houses laid on during the half year has been 368.

Dr. Profit and Loss Account, for the Half Year ending Dec. 31, 1875. Cr.

Engine charges			£2,911	3	11	Balance brought forward, June 30, 1875	£6,521 8 2
Maintenance of works			654	9	10	Deduct amount of 28th dividend, declared Aug. 26, 1875	4,416 9 5
Wages, turncocks, &c.			510	8	6		£2,107 18 9
Directors attendance fees			250	0	0	Half year's water-rates	20,986 13 9
Salaries—secretary, resident engineer, and clerks			802	13	0	Service laying	396 16 0
Collectors commission			692	7	8		
Rents			341	6	10		
Rates			518	14	11		
Income-tax			101	18	0		
Incidental expenses			190	12	10		
Current law charges			113	14	8		
Discount to landlords			350	8	5		
Allowances			314	3	8		
Bad debts			13	5	9		
Interest on loans			1,776	1	11		
Interest on preference shares			4,307	11	0		
Balance			9,652	7	7		
			£23,501	8	6		£23,501 8 6

The CHAIRMAN expressed the satisfaction the directors felt in presenting so favourable a balance-sheet. He briefly reviewed the items in the profit and loss account, and said their reasons for not declaring a higher dividend were known to the shareholders. They considered it far better to carry forward a substantial balance for the purpose of equalization of dividends. He explained the items of the capital account, and said the company's new works were progressing favourably, whilst the estimates formed by the directors, as to the quantities of water to be obtained, had been fulfilled upon trial. Contracts, to the extent of £50,000, had already been entered into for new works, and the directors felt assured that, long within the limit assigned by Parliament, the

works would be completed. It was the intention of the directors to make a call upon the new shares, payable on the 1st of April, which would give three months interest and dividend on the new capital. A number of shareholders had desired to pay up their shares in full, but the directors, having considered the matter, found that, in the interests of the company, they could not accept that offer on the supposition that such shares should take the ordinary dividend, which they hoped the company would continue to pay. They had, however, resolved that such shareholders as chose might pay the whole of the money remaining to be called up, and receive 4 per cent. interest on it, until the company found it necessary to call up the whole of the money, when, of course, the shares would rank as ordinary shares. This was the utmost the directors could do, as they could borrow as much money as they chose at 4 per cent. Having expressed the hope that the Rowley people would take the water of the company plentifully, as their wishes had been complied with, the chairman said he now came to the reverse of the bright side of the picture. The company had been subjected, he considered, for a very considerable period, to what he could not help characterizing as petty persecution on the part of Dudley. Those matters had not yet been settled. Summonses had been taken out against the company for non-supply of water on particular days. They were heard, and it was proved that the non-supply had been caused by the breakage of a pipe in a very treacherous district affected by mining operations. The summonses were adjourned, and they came on again on Saturday week. In the meantime, the company had not been slow to ascertain whether there was any true cause of complaint, and the operations considered necessary to do this led him to tell them that they must expect to see in the next balance-sheet an increased sum for maintenance of works. Ever since the 1st of January they had been engaged in examining the mining ground through which their pipes ran. Part of the district around Netherton and Dudley was composed of tracks of slag and cinders, and they had examined the pipes for a considerable length where there was no indication of a fracture above ground. They positively shut up the taps and stethoscoped their mains, for the purpose of ascertaining whether there was a flow of water; and having found out that there was one, they had to uncover and follow up the mains, at an expense almost equal to laying new ones. At length they found that, in consequence of the sinking of the ground from mining operations, one pipe had nearly pulled out the whole length of the socket, and an immense quantity of water was running away through the loose ground, and finding its way into the nearest drains. That was an accident against which the company could not take any precaution. So soon as the breakage was repaired there was an ample supply of water to the district. They had, however, been subject to great persecution in Dudley. The police had gone about to ascertain whether in any house there was no supply of water, and to take out summonses if they found any case of the kind. This being so, the company had had to employ detectives too, and the result had been that they had thereby gained information which, he hoped, would enable them to prove that, ever since the repair of the broken pipe, there had been an abundant and ample supply over the whole district. It was a miserable condition of things they were obliged to submit to. If the authorities of Dudley wanted to do something for the benefit of the public, let them read the accounts which had appeared in the newspapers of the condition of their dwellings, and spend their labour and money in improving that state of things. Let them also consider what would be the state of the district had not the company gone there to give a supply of water. The authorities of Dudley had also preferred an indictment against the company for supplying impure water, and the shareholders would be as much surprised as the directors were, when they heard that these charges dated back to 1871. From that time up to the present they had gone on without making any complaint to the company, and when they asked for a bill of particulars of the indictment, they learnt that on such a day in 1871, and at such a place, it was alleged there was a foul supply of water. The company supplied over 5000 houses in Dudley with water. They supplied the same quality of water to the whole of these houses; and was it reasonable to suppose that there should have been an impure supply of water to nearly 6000 houses without the company knowing anything about it? The company were not going, in the first place, to admit that their water was taken; and, in the next place, they would contend the fittings might have been out of order in consequence of want of attention on the part of the owners or occupiers. However, these matters would be dealt with at Worcester Assizes, held in March. The company felt they had a good case, and he should be much astonished if the Dudley case would hold water at all. These were teasing matters, and their policy was first to provide an abundant supply of pure and wholesome water for the whole district, and next to protect the interests of their shareholders. Dudley had received a reverse in the company's application to Parliament, and they could not take the beating, but were waiting for victory. He only hoped they would not find the victory more expensive than the defeat.

Mr. WILLIAMS, in seconding the adoption of the report, advised a compromise with Dudley, as the company could afford to be generous. If the Dudley people would respond to any measure of conciliation, he hoped it would be tried.

The motion was carried unanimously.

On the motion of Mr. EDMUNDS, seconded by Mr. JONES, the sum of £750 was voted as directors remuneration for the year, instead of £500 as hitherto.

The retiring directors were re-elected, as were also the shareholders auditors.

A vote of thanks was then passed to the chairman and directors, and the chairman, in acknowledging the compliment, said the board had once been perfectly willing to meet Dudley in a conciliatory spirit. They, however, were not met in a similar spirit, and they would not now sit down to be trampled on.

NEWCASTLE AND GATESHEAD WATER COMPANY.

MEETING OF SHAREHOLDERS.

The Annual Meeting was held on Tuesday, the 22nd ult.—Alderman PLUMMER, deputy-chairman, presiding.

The following is the directors report:—

The statement of accounts for the past year, which the directors have now to submit to the proprietors, is of a satisfactory character. The revenue of the company shows a substantial increase, and, at the same time, the working expenses have been materially reduced. The amount at the credit of revenue would have justified a dividend of 6½ per cent. per annum for the past half year; but, looking to the depression which still exists in the trade of the district, and its effect in retarding the progress of the manufacturing supply, the directors have decided to recommend that the dividend shall be at the rate of 6 per cent., and to carry forward a larger balance than usual to next account. The directors feel assured the proprietors will unite with them in heartfelt sympathy with the chairman, Mr. Burdon Sanderson, in the grievous calamity that has befallen him and his family, and in the cordial wish that he may speedily recover from the severe injuries under which he is at present suffering. The following is a comparison of the revenue with that of last year:—

	Tenants.	Receipts.
Year ending Feb. 1, 1875	47,409	.. £47,633 8 9
Year ending Feb. 1, 1876	50,896	.. 50,811 16 7
Increase	3,487	.. £3,178 7 10

As stated in last report, the directors have had under consideration a further extension of the company's gravitation works to meet the increasing demand for water, and, accordingly, a bill for the following purposes will be submitted for the approval of the proprietors at the special meeting called for the 22nd inst.:—1. The construction of a reservoir at Hallington. 2. The construction of reservoirs and aqueducts in the Swinburn district. 3. The enlargement of the Great Northern reservoir. 4. The deepening and improvement of the reservoir at Carr's Hill. 5. Works for separating the trade from the domestic supply, and for other purposes. With reference to the negotiations alluded to in last year's report, between the Town Councils of Newcastle and Gateshead and the company, for the purchase of the works, the offer which the directors received from the Corporation was not such as they could entertain, or recommend the shareholders to accept. Mr. W. B. Wilkinson, of this town, has been elected a director of the company. The following are the lengths and dimensions of the mains laid during the past year:—2-inch, 592 yards; 3-inch, 17,024 yards; 4 and 5 inch, 10,053 yards; 6-inch, 1354 yards; 12-inch, 90 yards; 18-inch, 891 yards; total, 30,004 yards. An interim dividend of 5½ per cent. per annum having been paid, the directors recommend that the dividend of 6 per cent. per annum for the half year ending Feb. 1, on the ordinary stock, free of income-tax, and 5 per cent. on the preference shares, be paid on the 8th of March. The directors retiring by rotation are Mr. R. Burdon Sanderson, Mr. Addison Potter, and Mr. William Dobson, who are eligible for re-election.

The CHAIRMAN, in moving the adoption of the report, said he was quite sure the shareholders would unite with the directors in regretting the unfortunate cause of his being in the position of chairman on that occasion, and in expressing sympathy with their chairman, Mr. Burdon Sanderson. With reference to the negotiations between the Town Councils of Newcastle and Gateshead for the purchase of the works, the offer which the directors received from the Newcastle Corporation was such that they could not recommend the shareholders to accept it. Since the report had been printed the subject had been revived, and the two corporations had again taken up the matter; but the directors had nothing definite, at the present moment, to communicate to the shareholders. The Corporations of Newcastle and Gateshead were having special meetings, but, of course, as the shareholders were aware, no agreement could be made, and no terms concluded, without their consent. Should the two corporations agree to make an offer such as the directors might think it advisable for the shareholders to accept, they would call them together and submit the whole matter to them; and it would then be in their own hands as to whether or not they would confirm any advice which the directors might be prepared to give. Some time ago they added Mr. Wilkinson to the board of directors, and were perfectly satisfied that he would be of very great use to them. In the absence of one or two from the board, they found themselves rather weak in numbers, and they wished to increase and divide the responsibility.

Mr. DOBSON seconded the resolution, and said that, in his long connexion with the company, he did not remember any report which had been of so thoroughly satisfactory a character as the one they had had that day, not only for the position it left them in at present, but also for the hopes it held out of a reasonable improvement. He sympathized with the chairman in the sad bereavement which had overtaken him, and trusted it would not be long before they found him again amongst them, and able to devote his talents and attention to the interests of the company. He was very much pleased with the satisfactory state of the report, as they had a substantial increase to their income, and were enabled to add to the dividend.

Mr. GRACE thought the information furnished in the report was of the smallest possible description. Last year an extension was agreed on, and no notice was taken of it at the present time. At that time also they were erecting an engine at Wylam for the purpose of obtaining additional supply; and they did not know from the report what was being done with it. From the accounts it appeared there had been expended at Throckley, Wylam, and Hallington, £26,000; but there was no mention in the report of whether the works were complete and ready. The present season was not a very wet one, and they might apprehend, as they got farther, it would be dry. If it should be a dry season, they had no information as to what water they had in any of the reservoirs, or what preparations had been made for supplying the town. It was said last year that they had engines at Newburn, and that, with the engines at Wylam, they would be prepared to supply a large quantity of water. He was informed that the engine at Wylam was in a very forward condition, and might be brought into use speedily; but that the quantity of water it would supply was not so great as might be expected. It was calculated to pump 3 million gallons a day, and was provided with a pumping power of 2 feet 7 inches, and it pumped into the old 2-feet pipe from Whittle Dean, and had to force that water up 300 feet for about three miles. It was to be presumed they would not gain all the quantity of water that that engine was capable of pumping. Going at a certain rate, it would pump 3 million gallons per day; but by the power exerted, a certain proportion was lost. Then, again, he was told that the old engine at Newburn had not been in use for some years. The other large engine, which was capable of doing a great deal of work, was constructed with power for 44-inch rams to pump into a 2-feet pipe—that was 44 inches into 24 inches, the practical effect being that they did not get half the strength out of it, and it could not be driven above half its speed for fear of straining or bursting the pipes, and that he had seen in practical operation. It was satisfactory, of course, to know that they were to get 6 per cent. dividend, and that the expenses were reduced; but the principal item of reduction was in cost of coal, which was nearly £2400 less than last year, but the total saving was under £2000; so that the other expenses were slightly increased. If this was to go on for some little time, the pumping would cost a very great deal more than they were at present led to expect.

Mr. ADDISON POTTER said the reservoirs were all full to overflowing. The engine at Wylam was finished, and only required to be connected with the main. At the same time they had been delaying a good deal in making the connexion, because, by the new bill, it would be seen there were some alterations to be made, which would cause a variation of their original plan; and with regard to what Mr. Grace had said, he thought they would be satisfied when they knew what was proposed to be done by the new bill. As to the engine at Newburn not doing its duty, and the old engine not being at work, he said that the old engine was at work last year; and, instead of pumping into a small pipe, they pumped into two pipes, one 24 inches and the other 30 inches, which was ample for all the pumping power. They expected in a very short time the filter-bed at Throckley would be finished, and that the whole of the water which came from Whittle Dean would be filtered. They had had a very bad season, or the filters would have been finished some time ago.

The CHAIRMAN said he might remark, in addition to what Mr. Potter had stated, that the pumps had not been required for four months. They had not pumped any water out of the river since last October, and he hoped it would be four months yet before any more was required; but if the day came that they had to pump again, they would be in a very different position to what they had ever been in before.

The motion was then put, and carried unanimously.

The CHAIRMAN moved—"That the proprietors unite with the directors in heartfelt sympathy with the chairman, Mr. Burdon Sanderson, in the grievous calamity that has befallen him and his family, and in the cordial wish that he, as well as Mrs. Sanderson, may speedily recover from the severe injuries under which they are at present suffering." He was quite sure it was not necessary for him to make any remarks in order to induce them most cordially to pass that resolution.

The motion, having been seconded, was carried unanimously, as were also resolutions for the re-election of the retiring directors and auditor, and the payment of the dividend recommended in the report.

The meeting was then made special, for the purpose of considering the bill of the company now before Parliament.

Mr. ARMSTRONG, solicitor to the company, explained the provisions of the bill, and said that, assuming negotiations with the Corporations of Newcastle and Gateshead were completed, he did not think they would interfere with the bill, which would have to go on, whatever arrangements might be made. Under the authority of last year's Public Health Act, there was a clause enabling urban authorities to buy water-works, and enabling water companies to sell their works to those authorities; but he was afraid the Act would not reach

this case, because it was more than likely that, if an arrangement was come to, it would be between the two corporations and the company. But the Act never contemplated a case of two corporations buying works. Even if it were, there would be a good many matters of detail to provide for, so that he thought it would be absolutely necessary that they should have the sanction of Parliament afterwards.

The CHAIRMAN said the Gateshead Corporation held a special meeting the previous day, and the Newcastle Corporation were to have one the day following on the subject; but until these meetings were over, the directors could not say anything, except that they were giving their closest attention to the interests of the shareholders, and that nothing would be done without calling them together. He moved that the meeting approve of the bill, subject to such alterations as Parliament and the directors should see fit.

Mr. CRUDDAS seconded the motion.

Mr. ALEXANDER asked whether the question of a constant supply to certain places had been considered, and whether the directors would seek powers to compel people to put up cisterns.

The CHAIRMAN said he had no hesitation in saying that nineteen-twentieths of the complaints would be removed if consumers had 24 hours storeage of their own. He was glad to say there had been no complaints from Byker for three months, and there they had had a constant supply.

Mr. POTTER said a new main had been laid to Byker, and had given a sufficient supply. They would be very glad to get power to compel every person to have a cistern; but the people of Newcastle would not like to be compelled to do it; and he knew the corporation would not allow them to have such a clause.

Mr. GRACE said no reason had been given why the Warksburn and Blackerburn schemes had been abandoned. The Swinburn scheme did not seem to meet with great favour from the corporation, the analysis showing that the water was unsatisfactory. He was told the Swinburn water in dry seasons was very defective, and it was called the Dryburn, as it went dry altogether at certain times. The stream was a very small one, and it was not of better quality than the Warksburn. If any addition was required, he would rather go in for a gravitation scheme, and do away with pumping altogether. Instead of expending £140,000 upon a supply which the corporation reported as unsatisfactory, they should go to the Alwin or Coquet, where they would get an unfailing supply. He thought that, before proceeding with the bill, the question required much further consideration.

The CHAIRMAN said they were not proposing to spend £140,000 in going to Swinburn. The great bulk of the money was to be spent in providing increased storeage reservoirs. Mr. Grace seemed to have been told a very great many alarming things; but supposing it was correct that the Swinburn sometimes became the Dryburn—which he did not believe—yet if they doubled their storeage, and got their reservoirs full, they were quite prepared for it. At the present moment they had 1200 million gallons of water in store, and when these additional reservoirs were completed, they expected to be provided with storeage to carry them over any ordinary droughts. His opinion, from the experience he had had, was that it was not wise to depend solely upon gravitation or upon pumping. The directors liked two strings to their bow; and this the bill would give them. He believed that when the bill which Government proposed to bring in with regard to the pollution of rivers was passed, the pumping-engine at Wylam would supply water of equal quality with any water to be found anywhere in the county; in fact, he had considerable doubt whether they would find any better water anywhere than the Tyne itself. If they considered the increase in the consumption, which was 12 per cent. or upwards in the year, and that they would have ten years to complete the works, they would find that they would not be completed too soon, and by the time the works were finished, they would have a sufficient number of customers to keep up the revenue, at least as good as it was at present. In reply to a question from Mr. Grace, he added that the daily consumption was about 9 million gallons.

The SECRETARY (Mr. D. D. Main) said there were some things which Mr. Grace had asked, which he might be able to answer; and first, as to the abandonment of the Warksburn and Blackerburn scheme. The directors gave the engineers instructions two years ago to survey the Warksburn and the Blackerburn, and no more; and they reported in favour of it as being a very excellent scheme; but seeing the discussion that was going on in the newspapers, and the number of schemes recommended, the directors enlarged their instructions to the engineers, and requested them to examine not only the Warksburn and Blackerburn, but every other stream in the county. Mr. Hill went to the North Tyne, the Reed, the Coquet, and the Alwin, and he (Mr. Main) went with him; and also to the Blackerburn and the Warksburn; and ultimately Mr. Hill fixed upon the district of the Swinburn, as not only being equal to the Warksburn, but being much nearer. The Warksburn was 12 miles distant from the Hallington reservoir, and they would have had to lay an aqueduct and pipe across the river Tyne to reach it; whereas the Swinburn, which was a very large stream, was within three miles of the present waterworks at Hallington. He could assure Mr. Grace that the Swinburn never did get dry. They had had gaugings of that stream over the last 12 years; it got to be small in summer time, like most of the Northumbrian streams, but in the winter it had been known to run as much as 200 million gallons a day. They, therefore, considered it a very excellent stream, and they did not rely upon getting the water in summer time, but upon storing it in winter time. They were proposing to construct reservoirs which would more than double their present storeage capacity. These held at present 1200 million gallons, the reservoirs they proposed to erect on the Swinburn would hold 1400 millions, so that they would more than double the present storeage. With reference to the analysis of the water, he could only say that the members of the Newcastle Corporation who visited the Swinburn along with the person who took the water for analysis positivoly laughed at it; and the chemist himself was not satisfied that the bottle, in which the water was taken, was clean. He, therefore, proposed to go and take another sample, and have it analyzed; but from other analyses which they had got of that water they found it perfectly good—in fact, it spoke for itself. There was very little white water to be got in Northumberland; but the Swinburn was one of the streams where the water was white and without peat.

The resolution was then agreed to.

On the motion of Mr. BROWN, seconded by Mr. SIMPSON, a vote of thanks was passed to the chairman, and the meeting terminated.

PROPOSED PURCHASE OF THE WORKS BY THE CORPORATION.

At a Special Meeting of the Newcastle Corporation, on the 23rd ult.—the MAYOR (Mr. W. H. Stephenson) presiding—

A report was brought up from the Sanitary and Water Committees to the following effect:—

The Sanitary and Water Committees have to report to the Council that they have continued to give their attention to the water supply of the borough, and the course expedient to be pursued by the council with respect to it.

They have had before them the bill brought into Parliament by the water company, and they have gone through its different clauses, and prepared suggestions for its alteration and improvement.

The bill proposes to execute the following works, viz.:—

1. The construction of a reservoir at Hallington.
2. The construction of reservoirs and aqueducts in the Swinburn district.
3. The enlargement of the Great Northern reservoir.
4. The deepening and improvement of the reservoir at Carr's Hill.
5. Works for separating the trade from the domestic supply, and for other purposes.

Your committees consider that, on the proposed works being carried out, the means of supply will be greatly increased by the additional sources from which water will be brought and the large reservoirs for storeage proposed to be added to the existing reservoirs. The public would thus be protected against the want of water heretofore experienced, and the supply be rendered more adequate to the increased and constantly increasing demand.

In the course of the discussion with the water company the propriety of the purchase by the corporation of their works has been constantly kept in view, and, at length, after repeated conferences and much negotiation, the water company have, subject to confirmation by their shareholders, agreed to sell on the following terms:—

£407,350, at 6 per cent. in perpetuity.
£175,683, at 5 per cent.
£127,649, averaging 4½ per cent.

In addition to which the ordinary accounts due from the company would have to be discharged, the purchasers receiving all outstanding assets.

Your committee have had the advantage of a personal interview with Mr. Hawksley, the eminent water engineer, on these terms, and on the subject generally. He has given it as his decided opinion that the terms required are reasonable, and that it would be hopeless to expect more favourable terms to be fixed either by Parliament or the Local Government Board.

The council will perceive that, if the works of the company are to be purchased at all, they will have to be acquired on the terms named, and your committees, after anxious deliberation, feel called upon to recommend that the purchase be made on the understanding that, if suitable terms be made with the Gateshead Corporation, the works should be held jointly by the two boroughs. They do not disguise from themselves that at first the purchase would involve some loss, probably about £1000 per annum, but this would, they believe, be compensated in time by the rapidly increasing consumption, and which at present averages from £2000 to £3000 per annum.

Alderman WILSON, in moving the confirmation of the report, said there were two mistakes in the committees report; the £175,683 at 5 per cent. ought to be £152,550. With this correction, the question would stand thus: The capital stock at 6 per cent. was £407,350; at 5 per cent., £152,550; debenture stock, £127,649; general charges, £15,073—£534,030. Difference in interest by the corporation borrowing money and paying 5 per cent., and the directors fees, £3500; and the present income of the company was £50,971. In taking over the works, even at the present time, they had a profit of pretty well on to £1000; and if the income went on increasing, as there was every reason to expect it would, it would not be at all a losing concern. He explained that since the matter was last before the council, the Corporation of Gateshead had adopted a resolution declining to join in the proposed purchase on the terms suggested. He also produced the correspondence on the subject, and some minutes of a conversation with Mr. Hawksley on the proposed purchase, after hearing whom, the committee resolved to recommend the council to purchase the works of the company at the rate of 6 per cent. perpetuity, upon the capital of £415,000.

Alderman HARLE seconded the motion, and after some discussion thereon,

The MAYOR said he did not suppose there was any difference of opinion with respect to the advisability of the purchase; but he thought it would be better if an amendment was moved remitting the matter back to the committee to see whether some modified terms could not be obtained, because, if the corporation were to subsidize the company with a 6 per cent. dividend in perpetuity, it made their shares 20 per cent. premium, and they were not worth that in the market. The shareholders ought to be satisfied with such security as the corporation could give them in perpetuity, seeing that the corporation gave them a right of going back upon all their securities; and if they obtained 5 per cent. they ought to be satisfied with it at par. Five per cent. would be a saving of something like £4000 a year. The whole thing had been done too quickly, and it was too colossal to be dealt with in that off-hand sort of manner. No harm could come by a little delay. He moved, as an amendment—"That this council, while approving generally of the principle of purchasing the water company's works, remits the report presented to-day to the Sanitary and Water Committees, with a view to their making better financial arrangements with regard to the same, and to report to the council."

Mr. PARKER seconded the amendment.

Alderman WILSON said it was perfectly useless to go to the directors with any other proposition than 6 per cent. They had tried them over and over again. The difficulty of referring the question back was that the capital of the company was increasing. Even since November last, when the committee recommended the corporation to make this offer of 6 per cent., the capital had increased £25,000. Since they first began the negotiations, it had increased £40,000. Everybody's mind was made up that they ought to have the works, and if they were to remain for twelve months, they would not get better terms.

On a division, the Mayor's amendment was carried by 23 to 15.

A meeting of the Gateshead Council was held on the 1st inst., when it was unanimously agreed to unite with the Newcastle Corporation in the purchase, upon the terms above mentioned.

DERBY WATER-WORKS COMPANY.

The Half-Yearly Meeting of Shareholders was held on the 28th ult.—Mr. GASCOYNE in the chair.

The following report was presented:—

It is with no small degreee of satisfaction that the directors are at length enabled to report to the shareholders that every part of the town is now completely supplied with water, the main arteries of all the highest districts being charged direct from the new summit reservoir at Eaton, and the inhabitants enjoying the advantage and welcoming the success of the long-desired high-level system, so effectually accomplished by their able engineers.

The mode by which this supply is afforded, although sufficient in itself, is at present only temporary, until the large storeage reservoir, now being constructed by Mr. Phillips, shall have been completed. Mr. Phillips is now some 14 months in arrear of the time fixed by his contract; but, in the face of several grave difficulties pleaded by him in extenuation, the board felt it unadvisable to press too strongly for its completion. It is hoped, however, that this reservoir also will be brought into use in the course of another three months, by which time several additional distribution mains will have been laid within the town itself, to regulate and adjust whatever inequalities of pressure may be found to exist.

The gross receipts from revenue amount to £5731 11s. 2d., or £44 18s. 7d. more than the average of the two preceding half years.

The revenue expenditure is £2822 14s. 8d., or £327 7s. 11d. more than the average of the two previous half years.

The net realized profit is £2908 16s. 6d., or £282 9s. 3d. below the average of both preceding half years; and, adding to this the surplus of £2121 16s. 7d. brought from the last account, there remains £5030 13s. 1d. now available for dividend. The directors recommend a dividend at the usual rate, which will absorb £3767 15s. 3d., and carry forward a net surplus of £1262 17s. 10d. to the credit of the next half year.

The contingent-fund at our disposal, in addition to the above, now amounts to £2202 11s. 6d., besides a suspense-fund of £2391 6s. 11d., temporarily available, amounting together to £4593 18s. 5d.

The general condition of the works, buildings, and machinery is pronounced by Messrs. Hawksley to be satisfactory.

The new offices of the company, now being erected in Babington Lane, are being pressed forward as fast as the season will permit, and it is hoped that, by the end of the current half year, they will have sufficiently advanced to enable the directors to meet the shareholders at the next general meeting in the new and more commodious boardroom.

The directors who retire by rotation at this meeting are Lord Scarsdale and Mr. John Huish, who are eligible, and offer themselves for re-election.

The auditor who retires by rotation is Mr. Peat, who is also eligible, and offers himself for re-election.

The report having been received and adopted,

The CHAIRMAN moved the declaration of the dividend. In doing so, he said: The balance-sheet, which had been placed before the meeting, would show that the company were in a satisfactory position, but in all other respects the directors felt that their great end had been attained. One very important

portion of their duties had been accomplished, that was, providing the town with the long-expected supply of water up to the highest districts within it—water in abundance, and of the most excellent quality, and at a pressure against which actually many persons had been to the office to complain, though they had been informed that this would be ultimately modified. This had been achieved without loss, without injury of any importance to life or limb, and also without litigation. The works yet unfinished were progressing rapidly, and would be completed long before the next meeting of the shareholders. Therefore, they were in a position to say that this was the last half year of the most important portion of the duties attached to their undertaking, and the company had now a supply of water of the greatest abundance, and were possessed of a solidly established and really first-rate and splendid property. The capital which they had expended at the time they obtained the new Act was £60,000, now it amounted to £155,000; that was to say, they had expended in new works during the interval of seven years and a half which had elapsed, £95,000, which entailed upon them an extra annual dividend payable of £3000, but that was by no means the sum to which it would eventually amount. Up to that moment, however, every farthing of it had been faithfully met out of the revenue, not out of capital; and besides that, they had a very considerable surplus of undivided profits, amounting to £1200 or £1300, to carry over to the current half year's account; in addition to which they possessed £4500 in the contingent-fund and suspense account, half of which was temporarily, and the other half permanently, available in the event of a distant possibility—but to his mind impossibility—of a failure of dividend. He had no doubt that the board shared the sentiment with him that not a single shilling would have to be taken out of the shareholders pockets in the way of reduction or sacrifice of dividend. But, of course, considerable expenditure had yet to be incurred—one item of which was to provide a new receiving reservoir, which would cost £3000 or £4000. The old reservoir could not be cleaned or repaired without stopping the water supply; but by constructing a new one, into which both pairs of engines could work, the supply could be uninterruptedly continued. Without the new reservoir they would do no good, but with it their works would be complete. Since the passing of their Act, 3500 houses, or their equivalents, had been added to the number which they previously supplied, the rents of which varied from £10 to £20 per annum, and it was from this source that they had been recouped for their outlay. In the last half year 460 houses had been put on their books, notwithstanding the great number of houses which had been demolished or withdrawn on account of the Great Northern Railway constructing their line through the town. Although in the month of December an addition of 68 houses was made to their supply, as entered on the books, 58 others were withdrawn by the Great Northern Railway Company. Further demolition might be expected to take place for a short time, owing to the same cause, but it would be only for a time, for a considerable addition to the number of houses in the town would doubtless be made. The advent of the Great Northern Railway Company into Derby was not an unpleasant circumstance as far as the Water-Works Company were concerned, for it would doubtless lead to an increased supply of water being required. After congratulating the shareholders upon the continued prosperity of the company, he said it was erroneously stated at a meeting of the ratepayers of Derby last week, that the cost of the corporation in opposing the water-works bill in Parliament was £500. The real amount was £2300, and had it not been for that opposition, in which the corporation made a great mistake, the company would have spent £7035 less of capital, and would thus have saved nearly £500 a year in dividends for ever, and which, in the last seven years and a half, had amounted to a loss of revenue of £3500.

Mr. CROMPTON said that, although the shareholders were extremely gratified to hear of the continued prosperity and hopeful prospects of the company, they must bear in mind that there was another question in which they, as shareholders, were as much interested—or, at all events, in which they ought to be as much interested—as in the amount of the dividend they were about to divide. That question, he believed the chairman would admit, was of great importance; it was with regard to the quality of the water supplied to the large population of Derby. The chairman had dilated with the greatest gratification upon the prospects of the company, because they had acquired a most abundant supply of water, which was a very important point to all water-works companies; but he would ask whether the chairman was equally satisfied that the quality was on a par with the abundant supply, because they could not shut their eyes to the fact that, in these days of scientific research with regard to the causes of disease, it had been found that, in nine cases out of ten, the health of a district mainly depended upon the quality of the water supplied to the inhabitants. It, therefore, became an important point to the outside public that they should have the assurance of the chairman that the quality and sanitary properties of the water supplied were on a par with the quantity to be obtained. He lived at a short distance from Derby, and most days he travelled by rail along the valley of the Derwent, and had watched the very large works which the company had been carrying on in the immediate neighbourhood of that river. He did not want to draw any inference, or make any insinuation that would be injurious to the company; but he should like to be assured that the tunnels and trenches which they had constructed, and which ran for a considerable distance within a few yards of the margin of the river Derwent, were to be charged with water supplied from the healthy tops of the adjacent hills, and were not in the slightest degree dependent on a supply from the river Derwent; because they could not shut their eyes to the fact that, with all the beauty attached to the Derwent, and all the poetry connected with it, before it found its way to Derby it had become a not altogether desirable water to drink, if they could get anything better. If they were able to pump up and fill the tunnel with good spring water, or water from any source but the Derwent, then it would be satisfactory to the public; but it might not be satisfactory unless they were assured that this was so, and that it was not intended to trespass largely on the Derwent for a supply. They must not accuse the corporation of acting unwisely in their endeavour, as the sanitary authority, to obtain possession of what was the basis of all sanitary arrangements—a good supply of water. That the company had retained the water supply of the town in their own hands, threw an additional onus on them to see that it was not only abundant but pure.

The CHAIRMAN said that as he saw Mr. Crompton a few days ago, he was to some extent acquainted with his views, and was consequently not altogether taken by surprise at the question put by him. But he must say that if Mr. Crompton entertained any opinion that the water was foul or unwholesome, he had put the question in the most temperate and careful manner possible, and had thus enabled them more calmly to consider what might be their reply. During the last few years the works had proceeded almost daily under his own supervision, and he knew every yard of land through which their supply came. In the first place, more than half their water was delivered by means of a conduit from the works to Coxbench, and this had lately been extended 2½ or 2¾ miles further by mains running through fields and catching all the most important springs—grand, beautiful water, from which they obtained above half their supply. That was attested by scores of witnesses, whose evidence was beyond all question—men eminent in their profession, from London and elsewhere, and not dependent upon anybody here. No one could complain of it, and Mr. Crompton would not complain of it. The remaining portion of their supply was obtained by making a 4-feet culvert of solid brickwork, 14 or 15 feet deep, which extended, he granted, for miles parallel with the banks of the river, but it was 66 feet from the river. Into this tunnel was collected, out of the gravelly stratum, streams of water of a most beautiful description, which ran down the hills, and were intercepted before they could get into the river. They were thus collected in the culvert, and conveyed by iron pipes through the depth of the river to the level of the receiving reservoirs of the company's works. He could say that he never saw or drank water like it. He had lived in Derby for 60 years, and he thought he could say he had drunk as much of the company's water as any single individual, and had paid as much money for water for himself and his tenants as most people, but he was certain he had never had to complain of the quality, and that he had never heard any complaint respecting it from those for whom he had paid for it. The level of the water in the new filter and tunnels always stood 4 or 5 inches higher than the level of the river, and he knew that the water running from the hills could not get into the river as fast as it got into the tunnels, and was carried to their works. But Mr. Crompton was afraid that the river tried to get into the company's tunnels.

Mr. CROMPTON: Undoubtedly.

The CHAIRMAN: But the level of one compared with the other showed that the tunnels were the highest, and the water, rather than find the apertures which would lead into the river, came along the tunnel constructed by the company and got into the works, and of this he had not the slightest doubt. The chairman then read extracts from the evidence of a number of scientific and other witnesses, who were examined before a committee of the House of Commons, of which Lord G. Cavendish was chairman, when the company were applying for additional powers of extension seven years ago. All of them approved of the scheme, and spoke in high terms of the purity of the water. He then said that there was, of course, counter evidence, which could always be obtained when paid for by a powerful corporation; but infinitely more stress was laid upon the desirability of the corporation having charge of the water supply than with reference to the water itself. In consequence of the opposition of the corporation, the surrounding villages were erased from the Act, thus necessitating a subsequent application by the company to Parliament. But their own conduct proved to be their own Nemesis, for the corporation were the first to feel the loss of the powers applied for, and the company had to obtain an Act to enable water to be conducted to the Rowditch estate for use at the new workhouse. Spondon was unfortunately omitted from the last Act which the company obtained, and the corporation had, in consequence, been obliged to give up one of the best sites in the district for a lunatic asylum, because they said it would cost some £600 to obtain a supply of water there. He hoped the evidence which he had read was sufficient to satisfy Mr. Crompton, in chief, and that the directors would feel that he would cordially assist them, and fall in with their views and their policy generally.

Mr. CROMPTON expressed his obligation to the chairman for the elaborate explanation he had given, and said he should have been perfectly satisfied with the opinion of the chairman alone, because he was not only their chairman, but he had been exceedingly active in his capacity; and, therefore, if the chairman had merely risen and said that, during the carrying out of the works, he had been present from day to day, and seen the pure springs bubbling up in the greatest abundance, it would have satisfied him, without any reference being made to the scientific evidence which was produced before the committee of the House of Commons. That class of evidence was procurable for money, either for or against a scheme, and never carried any very great weight with him, for he generally preferred to abide by the common sense of the people living in the neighbourhood. He understood, from the remarks of the chairman, that one half of their supply came from spring water, and the other from that nameless source of which they had heard so much, the river Derwent.

The CHAIRMAN denied that water from the river ever entered the filter tunnels or the company's works, and whatever nuisances existed in the river did not affect the company's supply.

The retiring directors and the retiring auditor were reappointed, and it was decided to make a second call of £5 per share upon the new ordinary £25 shares of 1875, and of £2 10s. per share upon the new ordinary £12 10s. shares of 1875, such calls to be made on the 1st of April. It was also decided to make a further call on the 1st of July of £2 10s. on the £25 shares.

The CHAIRMAN then moved that the sum of £20,000 be borrowed by the company on mortgage, under the provisions of the Act of 1873, and that the directors be authorized to borrow that amount at such times as might appear desirable.

Mr. W. H. MARSDEN seconded the motion, which was carried, and it was also agreed to sell 139 shares by auction.

Mr. H. M. HOLMES moved a vote of thanks to the chairman, directors, and auditors for their services during the past half year, which was seconded and carried.

The CHAIRMAN, in acknowledging the compliment, said the directors had not only performed their ordinary duties, but had promoted two bills in Parliament, the responsibility of which had been very great, and the result more objectionable to those who were opposed to this action than to the company. When they knew their own shortcomings, and were desirous of obtaining a remedy for all their defects, they were met with opposition, which had been expensive and disastrous, and but for which a good supply of water would have been forthcoming years ago. The opposition had also caused the company to lose the opportunity of supplying many new houses, as, for instance, at New Normanton, where hundreds of houses had been built.

On the motion of Mr. BAKER, seconded by Mr. MOODY, the remuneration of the directors was increased from £300 to £400 per annum, and, in addition, £100 was given to the chairman for his extra services, to commence from January last.

The CHAIRMAN, in returning thanks on behalf of himself and his colleagues, said the secretary, Mr. John Walker, had rendered such services to them which few men could do, and without his great attention, ability, and zeal, such satisfactory results could not have been attained.

The meeting then separated.

FATAL GAS EXPLOSION AT GLASGOW.—On Saturday, Feb. 26, a gas explosion of an alarming nature, and accompanied with fatal results, occurred in the east end of Glasgow. In consequence of alterations which had been made in Market Street, a number of men in the employment of the Gas Corporation were during the day engaged renewing the branches and repairing the connexions of the gas-pipes. Whether from the extra pressure on the main or not, a crack had apparently been made in the pipe which was laid under the house No. 45 Market Street, the ground floor of which is occupied by a shoemaker named William Turnbull. About one o'clock Turnbull, who worked in one of the rooms, smelt an unusually strong smell of gas, and some of the workmen outside having been called in, they came to the conclusion, after an examination, that gas was escaping from some of the pipes leading to the dwelling. One of the flagstones of the pavement was lifted, and one of the men drew a light along it, and instantly an explosion occurred. Not anticipating anything serious, the men had gathered round the hole, and by the force of the explosion they were hurled with considerable force in all directions. The windows of the adjacent house were completely smashed, and on the neighbours, who had rushed out on hearing the report of the explosion, entering Turnbull's apartments, the flooring was discovered to be torn up and shattered, while the unfortunate tenant was found lying in his room in an almost insensible condition. His right leg was severely fractured, the chest injured, and bruises were sustained about other parts of his person. He was removed to the Royal Infirmary, where he lingered in great pain until the following day, when he died. Of the other sufferers, Mrs. Turnbull was found to have got her left thigh much injured, while the workmen were more or less cut and bruised, and burned about the face, head, and hands.

AMERICAN GASLIGHT ASSOCIATION.

[Condensed from the Report in the *American Gaslight Journal*.]

(*Continued from page* 284.)

WEDNESDAY, OCT. 21, 1875.

Mr. T. LITTLEHALES, of Hamilton, Ontario, read the following paper on

WOODEN PIPES FOR GAS-MAINS.

In compliance with a request to prepare a paper, for the consideration of the association at the present meeting, and being desirous of contributing, as far as I can, to the fund of information which is elicited at these meetings, I would like to call the attention of the association to the question of wooden pipes for gas-mains, as I know there are a number of our members who feel an interest in this question.

I am fully aware that in discussing this question I shall be occupying the debatable ground, and shall very probably bring my cast-iron friends down upon me in full force; but if they can show that I am wrong, either in premises or in conclusions, both the association and myself will have been benefited by this discussion of the subject.

There are quite a number of gas companies on this continent which have laid a greater or less number of wooden pipes for gas-mains; but I have never been able to obtain any reliable data respecting the results obtained by their use. In many cases they are so placed in connexion with the cast-iron mains, that it would be next thing to an impossibility to obtain anything like an approximate statement of what they are doing, and any data that could be obtained respecting them would be mere guess-work.

When this subject was first brought under my own consideration, a number of objections at once suggested themselves to my mind against the use of wooden pipes for gas-mains; but further examination of the subject showed that some objections were more fancied than real, while others could be easily overcome, and that, in some respects at least, wooden pipes had the advantage over cast-iron ones.

The principal objections which most readily suggest themselves to the use of wooden pipes for gas-mains are—

1. The liability to leakage from the nature of the material itself.
2. The difficulty in making the joints tight, and
3. Their liability to decay.

As regards the first objection, there is no doubt but that the porous nature of the wood would allow a considerable quantity of gas to pass through it, unless some means were taken to stop the pores of the wood. If, for instance, the pipes were made out of dry wood, and laid without a coating of any kind, they would, in all probability, be useless for gas-mains; but the usual method of making and treating wood pipes is to take the green logs, bore them, and dip them in hot pitch or tar, make the tenons and sockets and cover them with paint, put hoop-iron rings on the socket-ends to keep the pipes from splitting when they are driven together, and get them laid in the ground as soon as possible after they are made. The idea is, that the sap and moisture being retained in the pores of the wood, that and the pitchy covering prevent any escape of gas. But, although the pipes of which I have had a most favourable experience were made and treated in the manner just described, I do not think it is the best system for making them, for several reasons.

1. That when the pipes are made in this way, it is absolutely necessary that they be laid soon after they are made (which is not always convenient or practicable), or else they are liable to crack and become useless.

2. The wood being already full of moisture, the pitch or tar cannot penetrate into it, and so the preservative properties of the tar are lost, and the coating is liable to chip off and leave the wood bare on the outside.

3. That the use of pitch or tar is objectionable as a coating for the inside, because the gas softens it and fetches it off. And it seems to me that there would be a danger, if the frost should get at the pipes, of the moisture being converted into ice, and tearing the fibre of the wood; but the latter objection may, perhaps, be more a theoretical than an actual objection.

But notwithstanding, and in spite of these objections (which can easily be overcome), wood pipes of 10-inch diameter and smaller sizes can be made to be perfectly satisfactory in every respect; and in places where the extremes of temperature between summer and winter are as great as they are in some parts of the United States and Canada, wooden pipes have most unquestionably the advantage over iron ones, inasmuch as wood being a non-conducting material, there is no expansion or contraction as with iron mains, neither would there be anything like the same amount of condensation.

As regards the second objection—viz., the difficulty in making the joints tight—I may say that, if the pipes are carefully made, there is not the slightest difficulty in making the joints perfectly sound and tight, by smearing the tenons and insides of the sockets with a thick red-lead paint before they are driven together. Some parties recommend the use of hot pitch for making the joints with, but the use of such material for this purpose should be carefully avoided, because the gas will soften it, and the joints will in time become leaky.

The service-pipes are connected in different ways; some simply have a short piece of taper pipe and drive it into the wooden main, and connect the service-pipe to it; but there are two objections to this method—viz., a danger of splitting the wood pipe in driving the taper pipe in, and that, in case of any settlement of the ground and main, there would be a great liability of the taper pipe drawing out of the main. The plan I adopt is to put an iron clamp round the wooden pipe, and screw the service-pipe into and through this clamp into the wooden pipe. This makes a secure and sound connexion of the service to the main.

In reference to the third objection—viz., the liability of wooden pipes to decay—it is a question which can only be settled by time, as far as their use for gas-mains is concerned, although there can be no doubt but that wood will remain sound for a great number of years under certain conditions, the principal of which is that it is protected from the atmospheric changes, which we all know will readily destroy either wood or iron, if they are not protected in some way or other. But I believe that they will remain sound and tight for a great many years; in the generality of cases until the mains become too small, and have to be replaced by larger ones; and that in certain kinds of earth they would last fully as long or longer than iron ones. We all know how rapidly cast-iron pipes are destroyed in certain kinds of soil, and for a swampy locality I would most unquestionably give the preference to wooden pipes over cast-iron ones. And any gas company that may be able to obtain wooden pipes advantageously, and is disposed to try them, need not be deterred from doing so by any fear as to the results, if the work is well and carefully done.

In November, 1873, the company with which I am connected required to extend their mains to supply a new section of their district, and as the locality and situation were such as to present an excellent opportunity for testing the merits of wooden pipes, the directors authorized the laying of 1½ mile of 4-inch wooden pipe as an experiment. They were made in the manner before described, and were laid by the company's men, under my own direction. The joints were made with very thick red-lead paint, and the greatest possible care was taken to ensure sound work. They were laid in sections of 20 or 30 at a time, and then tested by letting the gas into them, and carefully examining and applying a light to every joint and to every inch of the main.

When the work was completed, we commenced to use the main, and it was allowed to remain for about 18 months, by which time any settlement of the ground and pipes, and consequent leakage, ought to have shown itself. A 100-light meter was then tested, and fixed at the inlet to the wooden main, through which the whole of the gas passed, and at the end of one week the whole of the meters on that section were examined, and the full quantity which had passed through the large meter was indicated on the consumers meters, without one single foot of loss. At the end of two weeks more another examination was made, and the result was precisely the same—not a single foot of loss. At the end of another fortnight a third examination was made, when there was a loss of 150 feet, equal to 7·14 cubic feet per mile of pipe every 24 hours, or 3·29 per cent. on the gas delivered into the main.

Three subsequent tests were made, but inasmuch as during the same period several alterations had been made in the service-pipes, by which a considerable quantity of gas had been wasted, and a leak having been discovered at the outlet coupling of the large meter, there was of course a very considerable increase in the quantity of gas lost, but including these losses of gas, the results for the whole period of testing, amounting to 89 days, showed a loss of only 24·2 cubic feet per mile of main every 24 hours, or equal to 8·3 per cent. on the gas delivered into the main; and considering the loss from the leakages, above mentioned is included, I think the record is a pretty good one, especially when it is borne in mind that the consumption on that section was very small indeed—only nine consumers on the whole length, and a total average consumption per day for the 89 days of about 400 feet only, or about 46 cubic feet per day for each consumer.

It may be asked why there should have been absolutely no loss shown on the two first tests, and a loss on the subsequent ones, but I think that can be satisfactorily accounted for in this way. The first two tests were made during very hot weather, and the gas was being measured by the consumers meters at a considerably higher temperature than it was at the large meter, and so, although there appeared to be no loss, yet, if the gas had been measured at the same temperature in both places, there would have been some loss on the first tests, because it would be almost impossible to pass gas through that length of pipes, of any material they could be made of, and not lose some gas if it was measured at the same temperature at the ends. And the fact that the leakage, or, rather, the unaccounted-for gas, increased as the weather became colder, is strong evidence that the reason before given was mainly the cause of the difference. But, although the quantity of gas lost was considerable, when calculated on the per centage of gas delivered into the main, yet, when calculated on the mileage of pipe, it was exceedingly small; in fact, if the whole of our mains in the city of Hamilton were doing as well as this section of wooden mains, even calculated on the most unfavourable test of the whole series, our leakage account would only amount to 2·28 per cent. on the gas sent out from the works; and if we compare it with the results of the whole 89 days tests, and all our mains were doing the same as this section of wooden main, our leakage account would only amount to 1·02 per cent. on the gas sent out, which is a far different result from anything I have ever known in reference to cast-iron mains.

There is one matter which I would like to refer to here, although it is not strictly connected with the subject of this paper—it is concerning the method of calculating the leakage of a gas company. The general way of doing this is by the per centage on the gas sent out from the works, which is a most misleading and unsatisfactory system, and utterly unreliable for the purpose of comparing the results of different gas companies, as will at once be seen on examination. Take, for instance, a gas company whose annual make is 50 million cubic feet, and whose leakage account is equal to 10 per cent., or 5 million cubic feet, and that company double their consumption without increasing or adding to their mains, it is evident that while the actual amount of gas lost would not be diminished, the per centage of leakage would be reduced to 5 per cent. Or take another instance—two companies whose consumption is equal, but whose mileage of mains is very disproportionate, it is evident that although the mains may be equally well laid, and the whole of the work equally well done in each case, yet the per centage of leakage would be very much larger in the one case than the other, although the actual loss per mile of main may be exactly the same in each case; and, therefore, for the purpose of comparison of the results of different gas companies, the per centage method is a misleading one, and the more reliable way is to calculate the loss per mile of pipe.

Returning to the question of wooden pipes. At the time we laid the wooden pipes, the price of iron was very high, and it was costing us for 4-inch iron pipes laid in the ground complete, including everything, 1·89 dols. per yard, and the wooden pipes cost, including everything, 1·40 dols. per yard, say 23 per cent. cheaper than the iron ones. The makers of wooden pipes are well known, and any one can very easily ascertain the comparative cost of wooden and iron pipes. The question of cost will, doubtless, in most cases, be the great consideration in reference to the adoption of wooden pipes; and although I do not wish to be understood to be an advocate for the general adoption of wooden pipes in preference to iron ones, yet I must say that in certain localities I would prefer wooden to iron pipes at almost any price.

In conclusion, I may say that I am prepared, and shall be pleased to demonstrate the facts I have stated, to any one who is sufficiently interested in the question to visit Hamilton, and make a personal examination of the matter. My object is to place before this association the results of a fair and practical test of the merits of wooden pipes for gas-mains, and I trust that it may serve to bring out in discussion additional facts and information on this subject.

Mr. NEAL asked Mr. Littlehales if he intended to have it understood that the per centage should be calculated upon the length of mains. Supposing the mains of one company are 2 feet in diameter, and those of another are 18 inches, and the mileage of both was the same, would he calculate the leakage according to the superficial surface?

Mr. LITTLEHALES said: Of course it would have to be compared in that way. But take two companies whose mileage was greatly disproportioned. The mileage of one might be nearly double that of the other. One might say that their leakage was 15 per cent., and the other that it was 7 per cent., and the latter might be the worse result, because it was a per centage on the larger quantity.

Mr. NEAL: A 20-inch main exposes more surface than a 2-inch main. Supposing 20 miles of 20-inch main and 20 miles of 2-inch main, would the leakage be the same?

Mr. LITTLEHALES: I think the lesser friction on the larger main would counterbalance the difference, because, as you increase the size of the main, you decrease the friction. We know that the friction on larger pipes is much less, in proportion, than on the smaller ones.

Mr. NEAL: I take it for granted that in a city the mains are larger than in the country. I think the proper way is to reduce the mains to a given size, and then everybody, in making calculations, would have a common basis to go upon.

Mr. LITTLEHALES: Of course, that is a more satisfactory method; but the per centage system is not a satisfactory one.

A MEMBER: I should like to know if there is always an increase in the leakage in iron mains with lead joints. In my case, there is a constant increase going on, and has been for some time. About three years ago, the lightning struck a church whose service-pipe led into the main, and I suppose it followed the service-pipe into the main for about 700 feet each way. The gas instantly began a great leakage. It took place in the afternoon, and we did not discover it until the next morning, but, being very dark at the time, it was noticed that the gauge went down. We did not think anything about the lightning. We supposed that the gas was being lighted, as it was so dark when the storm came up; but the next morning we discovered that the lightning had reached the pipe, and that the loss came from that. We then went to work to find the place. We made holes in the ground, put a bar down, and applied a match (we almost always find a leak in this way), and we finally went over the whole

of our mains, and I suppose we then found all the leaks—at any rate, we reduced the leakage very much.

Mr. HARBISON: Was the lead in the joints melted by the lightning?

The MEMBER: No; we found that, for about 700 feet in each direction from where the lightning had entered the main, all of the joints were leaking a little, and we also found that all of the joints had loosened a little, so that we could run a thin knife between them. The works were built about three years ago. At first our leakage was so little, that we practically got paid for as much gas as the meter registered. Subsequently, there was a little loss in that way, and this increased gradually until the time of the storm, when the increase was very great.

Another MEMBER: I think when the leakage commences it will continue and increase. In the works I have charge of in putting down the pipes, they were put very shallow in the ground—but a few feet below the surface—and I invariably found that in the spring of the year, when the frost went out of the ground, the leakage increased. It went on from one year to another, until at last we lost about 25 per cent. of what we made. I then started to do something. I got a number of steel bars, and went over every foot of pipe. I succeeded in reducing the leakage from 25 per cent. to 10 per cent. We had then about 30 miles of pipe, and in tightening up the joints that were leaking, I examined them carefully, and in the winter I observed a little ring of light around the joint no larger than a hair, showing that when the pipe was contracted by the cold the joints separated a little; and, in the summer time, the pipe went back, but the lead would not go back. By going over them and tightening them up, I stopped the leakage; but I think that the great fault was that the pipes were not put down deep enough. They should be put down deep enough, so that there will be something like a medium temperature, then they will not be affected by heat or cold, and when you do that the joints will remain secure. I think that is the best way to stop the leakage—at least, I have found it so.

Mr. PRICE: One of the most important points in the construction of works for the distribution of gas has just been hit in my judgment—the proper laying of pipes, and the proper making of joints. The question has been asked whether, in the use of iron pipes and lead joints, the leakage will go on increasing constantly. There are so many different considerations connected with this matter, that it is almost impossible to answer such a question satisfactorily. I will state my experience. Some eight years ago, when I took charge, we had a large leakage. Part of the joints had been made with lead, and part with cement. We instituted a very thorough system of searching for leaks, by keeping a gang of men constantly employed perambulating the streets, punching down with bars, applying a match, applying their noses, and using every possible means to discover the leaks. We found a great many and corrected them. We found, in taking up old pipe and substituting larger pipe, that the work had been very badly done. It had been entrusted to irresponsible persons. In many instances the joints were simply sieves through which the gas had been escaping for some time. Then we adopted a different system. In the first place, we laid the pipe from 4 to 5 feet deep, below the frost and below the possibility of there being much contraction or much expansion. I hold that to be a fundamental point—to lay the pipe deep—and the question of how deep it should be laid depends upon the locality. In Minneapolis, where the frost goes down from 5 to 10 feet, I should be pretty sure to go below frost. I can see no other way to get along with the difficulty. In the next place we are careful to use the best spun-yarn. We do not buy an inferior quality, but we get the best. We do not buy any old leads. We buy nice pig lead—soft, nice pig lead. We then have a most thorough examination of the pipe. It is tested with the air-pump and mercury, in order to see if there are any leaks. If any leaks are discovered, they are corrected before the pipe is put down. By these means we have reduced our leakage 50 per cent. per annum. I believe if every company would have their pipes thoroughly tested under heavy pressure, and then lay them deep enough, and have the joints well and carefully made, it would, to a very great extent, solve this troublesome problem.

A MEMBER: I have no doubt but that this is the true idea. I found that some pipes which had been put but a little way in the ground all had small leaks in them. This has led me to think that the true way was to make rigid joints, and have them recorded so that you could know where to find them if you should want to get at them.

Mr. PRICE said it was of the utmost importance that the pipes shall be so laid that they will not settle at some points more than at others, and thus disturb the joint. With regard to wooden pipes, he might say that in a small gas-works, some 30 miles from him, they laid wooden pipes, but they had proved a failure there. He was told that they were crushing in and rotting, and the company were taking up a large number of them.

Mr. FLOYD: The experience with wooden pipes which we have had here, in the Middle States, has generally been disastrous. The only place where they have been used to any great extent was at College Point. They laid four or five miles of them there. At the time their works were very small, and they wanted to extend them. They were paying a very nice dividend, and they thought that, by extending their works, they could pay more. The question arose as to what kind of pipe they should lay. Finally, they decided on wooden pipes, and they put down four or five miles of them. The consequence was, that they used up all the capital of the company, and stopped paying dividends. They lost by leakage more gas than they got paid for. It was impossible for them to keep a supply for their customers, with all the retorts they were working.

Mr. LITTLEHALES, in response to the president, said the pipes to which he had referred were simply green logs—pine logs. They were bored out, and dipped into a heated pitchy preparation. He did not think that this was suitable for an inside coating, as the gas softened the composition. He could not say anything about their durability from experience, but his opinion was that, properly prepared at the onset, they would compare favourably with any other pipe laid for the same length of time.

Mr. FLOYD, in reply to a question, said the pipes he had spoken of at College Point were down about 2½ years, at which time they leaked so badly that it was almost impossible for the company, using all the retorts they had in the retort-house, to keep their customers supplied with gas. They had sufficient retorts, had the pipes been tight, to have supplied three times the amount they did; but it was impossible to keep up the supply on account of the leakage.

Mr. LITTLEHALES said he believed the durability of these pipes would be greatly increased if they were saturated in creosote. His own opinion was that in certain localities wood had an advantage over iron, being free from contraction or expansion. Especially was this the case in swampy localities, where the ground was constantly wet. In such localities it was almost impossible to keep the joints of iron pipes tight. He had some iron pipes laid in swampy ground, and the drips required to be pumped out every few weeks.

Mr. OLNEY said in the previous winter he was in the island of Porto Rico, and while there examined the works and the pipes. The pipes they used were 8-inch pipes with Russ joints, and extended from the works about 12 miles. A portion of it was French pipe, made out of zinc and covered with yarn, and then pitched, and a portion of it was encased in wood. It had been laid for something like 19 years, the iron pipe and the zinc pipe together. One part of the city became entirely destitute of light, while the other was supplied. By direction of the Governor-General a gang of men was sent out to inspect the condition of the pipes. The wood which encased the pipe was what they call beach cedar—that is the red cedar. The pipe was inside that, and was made of zinc. The wood, in every case where they opened it, was found to be entirely gone; it was laid about 2 feet deep. It was found that the pipe, where it was covered with the coating he had spoken of, was a mere shell; by pressing it with the thumb it would all crumble. In the iron pipe there was not a single leak discovered in the whole distance that it was laid.

LIME PURIFICATION.

At the meeting of the association in May last, an interesting paper was read by Mr. Forstall, of New Orleans, on "The Proper Preparation of Lime for Use in the Purification of Coal Gas."—(See JOURNAL, vol. xxvi., page 364.)

Mr. C. A. GERDENIER, superintendent of the Bridgeport, Connecticut, Gas Company, laid before the present meeting the following results of his experience with Mr. Forstall's method of lime purification:—

Date.	Index of Station Meter.	Feet of Gas Purified.	Bushls. of Lime Used.	Feet of Gas. Slaked Lime per Bushel.	Gallons of Water used to Prepare Lime.	Pressure in Purifier. Inlet.	Pressure in Purifier. Outlet.	Days in Operation.	Number of Purifier.	Feet per Bushel of Unslaked Lime.
1875.										
June 3.	1,120,000	866,000	125	6,928	210	2 9-10	2 6-10	20	1	13,856
,, 23.	1,986,000	940,000	125	7,520	250	2 8-10	2 7-10	22	2	15,040
July 15.	2,926,000	829,000	125	6,632	220	2 8-10	2 8-10	22	3	13,264
Aug. 6.	3,755,000	525,000	125	4,200	100	2 7-10	2 6-10	13	4	8,400
,, 19.	4,280,000	795,000	125	6,360	200	2 8-10	2 8-10	20	1	12,720
Sept. 8.	5,075,000	645,000	125	5,160	180	2 8-10	2 8-10	12	2	10,320
,, 20.	5,720,000	900,000	125	7,200	220	2 8-10	2 8-10	15	3	14,400
Oct. 5.	6,620,000	600,000	125	4,800	50	2 8-10	2 8-10	9	4	9,600
,, 14.	7,220,000	..	125	..	240	2 8-10	2 8-10	..	1	..

He remarked that these results did not come up to those of Mr. Forstall, still they would save his company 320·55 dols. a year, and he yet hoped to show better returns.

The SECRETARY said immediately after the Washington meeting, he directed the man at his works to prepare the lime after Mr. Forstall's process. The first time he tried it he met with excellent results, nearly approaching those of Mr. Forstall. After that he had failures, more or less, for above a month, but by perseverance, during the month of September, he purified 7000 feet of gas to the bushel, whereas previously he had only averaged 4300. He had a letter from the superintendent of the company that morning, stating that up to the previous day they had purified 7550 feet to the bushel for the past twenty days, with hydrate of lime, and tried a little slaked lime. The lime used was oyster-shell lime, and the gas was made from Penn coal.

Mr. CRENSHAW said Mr. Turner, of South Carolina, had mentioned a fact in connexion with his experiments. He stated that a portion of the lime he used became slaked to some extent, and when this lime was put under Mr. Forstall's process, the gas passed through it without being purified. His experience also was that the lime should be freshly slaked, in order to obtain successful results.

A MEMBER said Mr. Crenshaw had not mentioned the fact that the lime he referred to was air-slaked. That was where the trouble came in. When he (the speaker) went back from the Washington meeting, he used Mr. Forstall's method. He took a screen, as was suggested, with inch meshes, and having wetted the lime thoroughly, he passed it through this screen. It came out granulated, so that it lay up very light. He had five layers of trays, and he put on the lime in two layers, 6 inches on each. He had been working in this way since last July, and the result was that, whereas formerly he changed twice a week, he now only changed once. It took 90 bushels of slaked lime to fill one of his purifiers, and he had passed as much as 800,000 feet of gas through one purifier before he was obliged to change. From a specimen of this granulated lime, it would be seen that it was filled up with impurities. He had reached as high a result as purifying 9000 feet to the bushel. Previous to the adoption of this process, he averaged on the year a little over 5000 feet.

Mr. LITTLEHALES: There is one point I would like to mention. I have found in several instances that when the gas had passed through the last purifier and was turned on, that it was very foul, and, on examination, I found that even after the gas had passed the last purifier there was sulphur, although the purifier had just been changed, and I found that it required a little extra care in cleaning the inside of the lid and the sides of the receivers when changing them, as they had been so foul in the last purifier, that it had a tendency to foul the gas again.

Mr. GERDENIER: I found the same difficulty myself, but I make a practice in my purifying-house of cleaning the purifier with a stream of water, at a water pressure of 30 lbs., and give it a thorough washing, and make it so clean that you could lie down in it, almost without soiling your clothes. In that way I get all the impurities out.

Mr. EDGERTON: I will give some results from my own experience. In 1873, the result of purification was 45,000 to the barrel during the whole year. The highest quantity purified was in October, when it reached 56,000 to the barrel of unslaked lime. Divide that by the number of bushels in a barrel and you have the result in bushels. The highest amount of sulphur found was 90 grains and the least 4 grains. That corresponds very well with the best results obtained in England. In regard to the preparation of the lime, the time of slaking before use depends upon the strength of the lime. Very strong lime must be slaked several days before use. Then it must be piled up in heaps, and must be thoroughly saturated with water in slaking, so much so as to make a perfect mash out of it. The water in the course of time will be absorbed. If you rake the heap over and press it through a screen, you get it in the granulated form. If you work that with your hands you can squeeze the water out of it. As before explained, the impurities are carried from the outside of the lumps to the centre, and if you break one of them, you will find that it is saturated with impurities. The impurities are taken up by the moist hydrate to the centre of the lump. Shell lime does not require to be saturated so long before use. This lime is not quite so strong as stone lime, and it is generally necessary to slake it two or three days to get the best results; but it must be slaked so that it is sloppy, and after that thrown up in a heap. It is not necessary to screen the lime. If you rake the heap over, you will find that it is pretty well broken up.

Mr. GERDENIER: In slaking my lime I wet it as Mr. Edgerton says, very thoroughly, and then after two or three days I wet it again. I had supposed that it was necessary to screen it, which I did. Afterwards, at the second time of the wetting, I knocked it to pieces with the shovel, which seemed to answer the purpose. The highest production I am obtaining now is 11,500 feet to the bushel of lime. I have a box made, which contains the requisite number of cubic inches to make a bushel, so that it is accurately measured. I do not have any more pressure now than I had before I began to use the lime in this way. Before, with the same coal, I was averaging about 6000 or 7000 feet. Now my average has been about 9000 feet to the bushel of hydrate of lime. I find that I am making considerable gain in the use of the lime prepared in this way. When it is taken out of the purifier, every part of it is impregnated with impurities.

Mr. WOOD: I have been experimenting on Mr. Forstall's plan of purifying gas. My calculations were based on 80 lbs. of stone lime to the bushel. My boxes are 20 feet square. I used to run about 2½ inches of lime on each tray. I was then purifying about 10,000 feet per bushel of stone lime, before being slaked. My first attempt on Mr. Forstall's process was very unsatisfactory. The first thing I did was to dispense with layers of trays, and increase the thickness of the lime. I used three layers, 2½, 8½, and 9 inches thick. On the first attempt I think I had wetted the lime too much, and it was very unsatisfactory. I had

no more pressure on the inlet than I had on the outlet, therefore I came to the conclusion that my lime was too moist; and, on breaking it up, I found it was not impregnated to the centre. I then tried it a little drier, with a little better result. My last experiment with it was 19,500. I then had more pressure on my inlet than on my outlet. My next trouble was that, on lifting my lids, at about three o'clock in the afternoon, to take a part of it out, I found the trays on fire. The lime had heated to such an extent that it had set fire to the trays. The workmen were also considerably annoyed by it getting into their eyes. I found that it contained 8 per cent. of sulphur, while under the former process it contained 12 per cent. That explains my experience in using Mr. Forstall's process of purification by lime. There has been something said about air-slaked lime. I had an opportunity of trying air-slaked lime. I put 330 bushels of it in one box, and I could find no difference in its qualities for taking up the sulphur. I found that it took up about the same amount as the water-slaked lime. I think I shall be able to get better results than those I have spoken of, although I do not expect to arrive at the best results, as I use nothing more than nut coal, which has more sulphur in it than lump coal.

Mr. OLNEY: What grade of coal were you using at the time when your trays took fire?

Mr. WOOD: I was using nut coal. The coal is known with us as first and second coal. We have a little steamboat that goes to the different mines, and gets a quantity of this nut coal, first from one mine and then from another, wherever we can buy it. It comes off the Monongahela River, and contains more sulphur than the Youghiogheny coal; it is a different coal entirely. It is Pittsburg coal.

Mr. DWIGHT: I have had a like experience in trying this lime process, and have had about the same result. I think that is a great deal owing to the manipulation of the lime, and in putting it into the purifiers; it has to be put in with the greatest care. If put in too compactly in one part of the purifier, the gas will not pass through it. The water will not be taken up by absorption, as is claimed by the professor, but it will pass through parts of the box, and you will find a stratum of lime that has not taken up any impurities of the gas at all in the centre. We put it in about 8 inches thick. It will be taken up from the top and bottom, but there will be a stratum which has not apparently taken up any of the impurities. It has to be manipulated with the greatest care. I am trying an experiment, at present with very fair results; but have not progressed far enough to give any figures. We are mixing the lime with about one-third breeze; I think it will purify more gas than if used as Mr. Forstall sets forth. There is one point I would like to mention, and it is this: About two years ago we changed our purifiers, and enlarged them; they had become too small for our service, and we found after the change that we ran nearly double the quantity of gas through the same lime that we had been able to do before. I think a good deal depends upon the size of your purifiers. The greater the distance the gas has to pass through the purifiers, the more it comes in contact with the lime, and the more the impurities will be absorbed by it. I have been in the practice of wetting the lime, as spoken of by Mr. Forstall, for four or five years. The quantity of water I use is seven barrels, of 30 gallons to the barrel, to 60 bushels of lime, which is about 200 gallons of water. I have tried as high as 11 barrels, but by careful experiment I think that seven barrels is about as much as should be put in. We use the shell lime, and put in six bushels to the charge, and we average a little over 9000 feet to the bushel. We are using Penn coal and its equivalent, Mount Washington coal.

(To be continued.)

HEATING BY GAS.

By Mr. J. WALLACE.

On Wednesday evening, Feb. 16, a paper was read, at the Society of Arts, by Mr. John Wallace, of Newcastle-on-Tyne, on "The Combustion of Coal Gas to Produce Heat, and the Theory of the Structure of Flames." The paper was mainly a repetition of the paper read by that gentleman at Manchester on the 14th of December, 1875, and reported *verbatim* in the JOURNAL of the 4th of January last.

The CHAIRMAN (Sir Francis C. Knowles, Bart., F.R.S.) said, before he proceeded to invite discussion on the subject, which had been so clearly and ably brought before the society, he might, perhaps, be permitted to make a few observations. It would be noticed that the process referred to by Mr. Wallace was one for the purpose of producing heat. When light alone was to be produced, it was shown that the particles of carbon thrown up above the flame might be collected, and oxidized on a piece of tin plate. Those particles of carbon were freely heated by that portion of the gas which was thoroughly burned, and, as was well known, all bodies highly heated—not only particles of carbon, but particles of other substances—when raised to a great temperature, evolved light. So, in the example given by Mr. Wallace, as the quantity of light evolved was reduced, greater heat was obtained. This, therefore, being a process for obtaining heat rather than light, Mr. Wallace must be considered to have been very successful. There was one remark he would like to make, respecting the colour of the flames in the burner exhibited. It struck him—and Mr. Wallace would correct him if he was wrong—that a kind of separation had taken place, and that the exterior flame, which appeared of a faint reddish hue, was the hydrogen flame; and that the interior, which was of a bluish-green colour, was the product of the combustion of the particles of carbon collected, but which, in an ordinary flame, escaped. There was a sharp line of demarcation between the purple light, or flame, and the blue, and this, it seemed to him, was the precise measure of Mr. Wallace's success. At the same time, it must be borne in mind what it was that was required, whether light or heat; if they wanted the one, they must sacrifice the other, and, therefore, Mr. Wallace's remark respecting the stoves generally offered to the public was perfectly correct—there was far too much light in them for successful heating apparatus.

Mr. WALLACE said he would throw the shadow of an opaque object through the flame of his improved Bunsen burner on to a sheet of paper, the gas burning at the rate of at least 30 or 35 cubic feet of gas per hour. Even the light of a match was clearly visible through this large flame.

The CHAIRMAN said he assumed that that was the hydrogen flame, the interior flame being the carbon flame. There was complete combustion of the carbonic oxide, and hence the heat evolved from it.

Mr. F. W. HARTLEY said he had listened with great interest to the paper, more especially as he had had the opportunity of examining a number of Mr. Wallace's earlier burners, and had also made many experiments with them. He certainly thought these burners were constructed on principles far in advance of the ordinary Bunsen burner of the laboratory. But, while admitting so much, he must, in some measure, dissent from Mr. Wallace's conclusions with regard to the applicability of gas for heating purposes, as compared with solid fuel. Unfortunately he had no notes then with him; but he might mention that some time ago he read a paper before the British Association of Gas Managers on this very subject, wherein he instituted a comparison between the heating power of coal gas and that of solid fuel, and was obliged to come to the conclusion that coal gas, either applied to warming or boiling, or for steam-engines on a larger scale would be three to four times as expensive as solid fuel. The data with which he started were nearly identical with those Mr. Wallace adopted—namely, that 13·2 cubic feet of gas were equal to 1 lb. of coal. Nevertheless, the conclusion to which he was driven was diametrically opposed to that expressed in the paper just read. He observed Mr. Wallace had spoken of the heating power of gas-flame in a chandelier; when gas was burnt openly in that way, the whole heat given off by the flame was present in the room; but when it was burnt in a stove of ordinary construction, which must be ventilated, they must part with a considerable portion of the heating power of the gas itself, as was the case even in that modification of stove recommended by Mr. Wallace, which was very good in its way, though it, he believed, might be equalled by some others in the market. With respect to some of the experiments made, he might remark that he did not know the limited heating surface named of 10 or 12 inches in a boiler was accepted generally, but he knew in the Jackson boiler Mr. Goddard, of Ipswich, got a calorific effect of something like 9 lbs. of water evaporated for each 13 cubic feet of heat employed. With regard to the Bunsen burner itself, he did not know whether they were coming to the conclusion that that kind of burner gave off more heat than any other in which gas was perfectly consumed, but, if so, he could not agree to it. If the gas could be supplied with the full amount of oxygen necessary to its combustion, it mattered not what burner was employed; the same amount of heat could be obtained; the only advantage was that in the Bunsen burner the flame was intensified, so that objects placed in it were raised to a higher temperature. The flame might be concentrated, but the total quantity of heat evolved was the same in either case, if the gas were completely oxidized. All chemists would acknowledge that whether a body were oxidized slowly or rapidly, the same amount of heat was given off, whether that heat was sensible thermometrically or not. He wished to make this remark, because he was sometimes at issue with other people as to the application of the Bunsen burner; for cooking stoves especially. For laboratory purposes, when metallurgical and some other operations had to be carried out, the Bunsen burner answered admirably, but for ordinary purposes it would frequently happen that a simple jet burner was more advantageous, particularly in cooking stoves. Mr. Wallace had got rid of one of the disadvantages of the Bunsen burner, in preventing the return of the flame, but it must be remembered that in cooking and heating generally, an enormous advantage was derived from the radiated heat, which, in these burners, was very little. It had been stated, on the authority of Dr. Letheby, that the radiant heat from a Bunsen burner was only equal to 12, from an ordinary burner it was 30, and from a burner with a spiral of platinum in it, it was 85, thus showing that if solid matter could be got into a flame, there would be an enormous increase of radiating power. The quantity of heat given off from fuel in an ordinary fireplace had never been fully determined, the estimates varying from one-third to one-eighth of the total quantity produced, but he believed the latter figure to be much too low. There was an enormous quantity of radiated heat, which was not to be readily measured by any known means. In making these remarks, he by no means meant to detract from the value of Mr. Wallace's burners, which he much appreciated.

Mr. A. G. SOUTHBY thought all must admit that they were much indebted to Mr. Wallace for his improvements in Bunsen burners for heating large objects to a great heat, but he must differ from him in his conclusion, that the only way of using gas economically for heating was by means of a Bunsen burner. When the heat was to be applied to boiling water, or warming a room, or any domestic purpose, a comparatively slight heat only was required, and he had come to the conclusion that water could be boiled rather more economically by an ordinary bat's-wing or fishtail burner, in an apparatus constructed for the purpose, than by any Bunsen burner in the market. A little stove, which was sold for 1s. 6d., would boil a larger quantity of water, with the same amount of gas, than any Bunsen burner as ordinarily used, though if applied to the same apparatus it would give equal results. If carbon and hydrogen were totally consumed, they must give out exactly the same amount of heat, however it was accomplished; but the effect of the radiant heat in boiling was commonly very much under-rated. In an ordinary steam boiler, one-fourth of the heat which went into it, came directly from the fire. With regard to the amount of heat wasted in such a stove as Mr. Wallace had exhibited, he had shown that in one constructed on the same principle, it was only two per cent., and even less than that, if the pipe which carried off the products of combustion were used for heating the ventilating air as it came in from outside the building.

Mr. BRANSON said he thought the last two speakers had rather fogged the question of heating by gas by introducing the word "if" rather too freely, saying that an ordinary burner would produce as much heat as the Bunsen if properly arranged. But hitherto it had always been the question how to do it properly. Mr. Wallace had shown pretty conclusively that the flame of an ordinary burner impinging upon metal left its own carbon there, which, being a great non-conductor, would tend to neutralize the object of using gas at all. For many years past he had used the largest gas furnace in London, or probably anywhere else, and he could only say that a properly constructed Bunsen burner, where the flame had to impinge upon the metal, was simply invaluable. It gave the operator complete control of the temperature, which was not the case in a coal furnace, and in many processes which required delicate treatment this was an inestimable advantage. The only disadvantage was that which had already been mentioned—viz., the expense of the gas, which, whether burned with or without air, certainly cost three times as much as coal, and probably four times, and he did not see how that could be prevented, unless the operations were large enough to permit the user to make his own gas. The great difficulty he had found in the use of gas was that unless you had utensils upon which the flame could directly impinge, a great deal of heat was dissipated. It could not be retained as was done in the case of a coal furnace. On this account he believed that gas as a fuel would never supersede the use of coal and coke as generally applied.

Mr. RILEY said he had been much interested in the paper, but must agree with what had been said by the first speaker, that if the carbon and hydrogen were completely oxidized, the same quantity of heat would be obtained whatever burner was employed. As to the cost of gas and coal, there could be no comparison. Mr. Wallace had taken the cost of coal when a very small portion of it was utilized, as in an ordinary firegrate, which was the most wasteful way possible of using it. He himself had tried to distil water with gas, but found the cost enormous as compared with coal. Some years ago he was foolish enough to trust some one to put up a gas bath in his house, but it filled the place with the smell of partially burnt gas, and proved a complete failure, though he managed to improve it somewhat himself. One difficulty was that there was always a large deposit of moisture, which condensed on the surface of the pipes, and tended to check the draught; this was a great obstacle where it was wished to heat water by circulation. The best and most economical mode of heating water by gas which he had seen was that called the Geyser, and a friend of his had used one for a bath, and spoke most favourably of it. The principle of construction was that there was a series of very small jets of gas at the bottom of a cylinder, 2 or 3 feet high, and the water was made to trickle from the top over a number of copper tubes, which were heated by the gas.

Mr. WILLS remarked that the writer, at the close of his paper, said he had not given any account of the chemical and scientific side of the question. But it must be borne in mind that the questions which had been mooted all depended upon certain scientific principles, and must be decided by them. In a common luminous gas-flame there was the heating of particles of carbon; and the reason of the luminosity was, not that there was carbon present, but because there was a sufficient space of time during which the particles were raised to incandescence. If this time were appreciable, luminosity was the result; but if not, it was lost, and this was the case when the separation of the carbon, and its conversion into carbonic acid, took place simultaneously. When a gas flame was fed with air there was no luminosity, but what would have existed in the form of light was converted into heat. This was one gain;

but there was also another, in the concentration of the heat into a smaller space. A luminous flame was of considerable length, but the moment air was introduced the flame was shortened, and, consequently, gave an increased temperature. One or two speakers had slightly confounded two different things—calorific value and calorific intensity. It was quite true that a certain amount of heat only could be obtained out of any given fuel, whether burned slowly or quickly, and this was the value, but the intensity was a very different thing. They might get out of a piece of wood a temperature of 2000° Cent., or only 10° Cent. if it decomposed slowly; and this depended on two conditions—the space, and the time in which it was burned. When air was introduced into a gas flame, more of it would burn in a given time and in less space, and the temperature rose correspondingly, the degree depending, in great measure, upon the apparatus you used. He thought Mr. Wallace was in error in describing the Bunsen burner as having three zones, as he believed two—the interior cone in which there was simple gas, and the outer one in which the gas was burning. He had a little difficulty in accepting the chairman's suggestion that hydrogen was burning outside and carbon inside, because the hydrogen mixed with the air much more rapidly and energetically than the carbon, and hence the combustion of the hydrogen would be more likely to take place near the supply of air than the carbon. The absolute temperature of hydrogen uniting with oygen was something like 34,000°, whereas that of carbon and oxygen was about 80,000°, and, therefore, the probability was that the greater energy of combustion took place nearest the point of contact with the air. The principle of the Bunsen burner depended on this fact, that the speed of gas and air issuing from the tube must be greater than the speed of combustion of the mixture. Oxygen and hydrogen, when combined, formed water, and in doing so produced the greatest amount of heat and force with which they were acquainted. Such a mixture was found by practical experiment to burn at the rate of about 38 feet per second; and with a tube 8 feet long, it would take about one second for the flame to traverse the whole length. If, therefore, it was required to burn them at the extreme end, the mixture must pass along it at a greater speed than 38 feet per second, or else the flame would go back, and an explosion take place. The same thing occurred in the case of gas and air, though the mixture was not quite so explosive; they would burn down the tube at a given rate, and it was necessary to have the gas passing out at a greater rate than the gas would burn backwards. All the appliances Mr. Wallace had introduced were for the purpose of retarding this backward flow. The most intense heat no doubt would be found at the point of the inner cone, where the most energetic combustion took place, and it would have been noticed that the platinum got brightest just at the top of the blue flame.

The CHAIRMAN, in proposing a vote of thanks to Mr. Wallace, said he did not understand that he proposed to supplant ordinary fuel by gas in all cases, but only to show the best mode of utilizing it for heating purposes; otherwise there would be such an enormous amount of coke produced, they would not know what to do with it. It was only desired by the writer to limit his claim to the more perfect combustion of carburetted hydrogen where it was used.

Mr. WALLACE, in acknowledging the vote of thanks, said he had been much pleased at the full discussion which had taken place, and assured Mr. Hartley that no one could express an adverse view more agreeably than he had done. At the same time he must repudiate the error of supposing that gas gave out more heat when burned in one manner rather than another, supposing it to be completely oxidized in each case, and it would be found that he had expressly guarded himself, in an early passage in the paper, from countenancing such an idea. With regard to the velocity of combustion, or the rate at which the column of gas rose in the tube, and the rate at which it was burned, the total area of the openings in the cap might be considerably less than the total area of the tube, and therefore the speed of combustion was in the inverse ratio of the two areas; so that although the speed of the gas passing through the holes might be greater than the rate of combustion, yet the rate of the ascension of the column within the tube might be considerably less, and that was one of the advantages of the perforated cap. His view was, that in a small flame there were three zones, that in a larger one the second zone disappeared, and that in a much larger one, with a greater increase of air pre-admixed, the hollow space disappeared. A small flame more resembled that of a candle, and a very small flame gave no light, although no air was mixed with it previous to combustion, because its surface was such, in proportion to its bulk, that the oxygen could unite with it with sufficient facility to prevent any luminosity.

ACTION OF LIGHT ON SELENIUM.

By Mr. C. W. SIEMENS, D.C.L., F.R.S.

On Friday, the 18th ult., Mr. C. W. SIEMENS, D.C.L., F.R.S., gave a lecture on this subject at the Royal Institution.

In his introductory remarks Mr. Siemens referred to the fact that, while Newton laid down incontrovertible principles regarding the nature of light, it had been reserved for physicists of recent times to prove the effect of light upon solids. One of the most beautiful illustrations of the permanent effects of light upon solids is furnished us through photography. Another effect is rendered visible by phosphorescent salts, which, when acted upon by light, continue to glow in various colours for a length of time when taken into a dark room.

During the previous week only, at the same Institution, Mr. Crookes had shown experiments illustrating the mechanical action of light on solids. It is, too, light that breaks up the carbonic acid in the leaves of plants in order to separate the carbon. Carbonic acid may be broken up by heat; but at a temperature of 2500° C., which would destroy all vegetable organization. The influence of light on selenium makes known another action—an action which regulates the extent to which it is an electrial conductor.

The history of the discovery is briefly this. Mr. May, a telegraph clerk at Valencia, noticed that a stick of crystalline selenium, such as had been used for some time in telegraphy where high electrical resistance was required offered considerably less resistance to a battery current when exposed to light than when kept in the dark. The facts were made known by Mr. Willoughby Jones in 1873, but there for a while the matter rested. The statement was received with some incredulity. Could it be possible that the mere superficial action of light upon a solid substance could so change instantaneously its internal condition as to open, among its particles, flood gates for the passage of the electric current, to close again upon the removal of the light? The question has within the last twelve months been made the matter of independent inquiry by Dr. Werner Siemens in Germany, and Professor Adams in England. By different methods these two observers have arrived at results which agree in most points of fact, though they somewhat differ in the deductions they draw from them. Selenium, an elementary body discovered by Berzelius in 1817, is placed by chemists in the border territory between metals and metalloids, and it does not seem to be amendable to the laws governing either of these natural groups. If melted it presents a brown amorphous mass of conchoidal fracture, which is a non-conductor of electricity, but if a stick of this amorphous selenium is exposed for some time to the heat of boiling water it assumes a crystalline fracture, and when again inserted in the galvanic circuit it is found to be a conductor of electricity.

Some experiments were shown of the action of light by a contrivance of Dr. Werner Siemens, in which the selenium under examination was in a form in which the surface action produced by light can exert its maximum effect. Two spirals of thin wire (iron or platinum) are laid on a plate of mica in such a way that the wires lie parallel to one another without touching. While in this position a drop of fluid selenium is made to fall upon the plate, filling the interstices between the wires, and before the selenium has had time to harden, another thin plate of mica is pressed down upon it so as to give firmness to the whole. The two protruding ends of the spirals serve to insert this selenium element in a galvanic circuit. Mr. Siemens calls this disc his "sensitive element." The whole arrangement is no larger than a sixpence. Its action was shown in this way:—It was placed in a galvanic circuit, at one end being a Daniel's cell, and at the other a delicate index galvanometer. The "disc" was first inclosed in a dark box; the circuit was "made," but no electricity passed through—no movement of the index was seen. The "disc" was then exposed to light; still no action was apparent. Another disc was taken that had been kept in boiling water for an hour, and gradually cooled. In the dark box it gave a slight passage to electricity as indicated by the index, but as soon as the light was admitted the index registered a great passage of electricity. Another disc heated to 210° C., and allowed to cool, was then used, and a greater action still was apparent with this. Dr. Werner Siemens has worked at the meaning of this, but without tables and diagrams it is not possible to convey an adequate idea of his results. The basis of the change in condition seems to depend on the extent to which the selenium has been heated. The experiment was shown of the effect of different parts of the spectrum on a disc. The actinic ray produces no effect, but the influence increases as we approach the red end. A selenium photometer was also shown in action, the principle of which is to compare the relative effects of two lights in affecting the conditions for the passage of electricity.

At the end of the lecture a little apparatus was put to work, which Mr. Siemens calls a selenium "eye." There is a small hollow ball, with two apertures opposite to each ether. In one is placed a small lens, 1½ inch diameter, and at the other a "disc." The disc is connected with a Daniel cell and a galvanometer, and this represents the retina. There are two slides, which represent the eylids. The action of light on the disc is indicated on the galvanometer. Not only was this shown to be sensitive to white light, but sensitive in different degrees to different colours. Mr. Siemens suggested that it would not be difficult to arrange a contact breaker and an electro-magnet in connexion with the galvanometer in such a manner that a powerful action of light would cause the automatic closing of the eyelids, and thus imitate the spontaneous brain action of blinking the eyelids in consequence of a flash of light. To physiologists this analogy may be suggestive regarding the important natural functions of the human frame.

THE FLOODS OF 1875 AND WATER ECONOMY.

By Mr. G. J. SYMONS, Secretary to the Meteorological Society.

At the Meeting of the Institution of Civil Engineers held on Tuesday evening, the 29th ult.—Mr. G. R. STEPHENSON, President, in the chair, one of the papers read was "On the Floods in England and Wales during 1875, and on Water Economy," by Mr. GEORGE J. SYMONS, Secretary to the Meteorological Society.

In 1875, the number as well as the volume of the floods was unusual. They were prevalent in many parts of England and Wales during the whole of the latter part of the year, especially in July and November.

The first flood, on the 15th of July, was the result of a rainfall of large amount and duration. The rain lasted on an average about 30 hours, but in most localities 90 or more per cent. of the amount fell in 24 hours, and at some stations all fell in 24 hours. This flood was chiefly confined to the West of England, and its effects were most serious in Monmouthshire and South Wales, where at many stations the rainfall on the 15th of July was nearly twice as great as the amount previously recorded at those places. Generally heavy summer rains occur in thunderstorms, but the July rain in Monmouthshire and South Wales was not of this type, and was quite as remarkable for its steady persistent rate, of about one inch in each of five successive periods of five hours, as for the total quantity. To give a general idea of this rainfall in Monmouthshire and South Wales, a few stations were mentioned at which the depth exceeded 4 inches. Thus it was at Tintern Abbey, Monmouth, 5·91 inches; at Springfield, Newport, 5·45 inches; at Tynant Radyr, Glamorgan, 5·10 inches; at the Cemetery, Cardiff, 5·05 inches; and at Ely, Cardiff, 5·02 inches. The damage caused by this flood was considerable. The Avon and Frome overflowed their banks; at Cinderford, Gloucester, a reservoir burst and flooded two or more mines; at Monmouth a reservoir burst and numerous bridges were swept away; and the traffic on the greater number of the Monmouthshire and Glamorganshire railways was interrupted.

From the 16th to the 18th of July heavy rain fell in various parts of the East of England and the Midland counties, but with no very exceptional amounts, the largest reported being near Louth, 1·36 inch, and at Halifax, 1·18 inch. The districts visited by these rains had, however, previously been nearly saturated by those of the 14th to the 16th, consequently the results were very serious, especially in Staffordshire and the adjoining counties. In fact, throughout the Midlands much damage was done, and many towns were inundated, including Northampton, Huntingdon, St. Ives, Burton-on-Trent, Kidderminster, Coventry, Nuneaton, &c.; a canal burst near Tamworth, and railway traffic was stopped on several lines.

Although during August and September several floods occurred, doing considerable local damage, they were quite eclipsed by the much larger and more general ones of July, October, and November. On the 9th of October a heavy fall of rain occurred over central England, especially in the dry district extending north-east from Banbury towards Northampton. The depth of rain at Banbury, and at stations above it in the valley of the Chervell, was 3 inches or upwards, consequently that river was excessively flooded, as was also the Avon, both at Stratford-on-Avon and at Evesham. During the next nine days there was occasional slight rain, amounting altogether to about half an inch, which was just sufficient to prolong the discharge of the above flood. Much land was, therefore, under water, and most of the rivers of central England were fuller than usual on the 18th of October, when another heavy fall of rain commenced, which lasted through the 19th and part of the 20th. During this time, upwards of 3 inches of rain fell over part of Staffordshire; and at Exeter 3·26 inches descended in a few hours, which produced much local but no general damage. It was far otherwise in the great midland tract, which had received upwards of 2 inches depth of rain. The ground being saturated, or nearly so, all the low-lying lands were flooded, and the total area under water was probably greater than it had been since 1852.

Some idea of the exceptional nature of the floods of 1875 might be gathered from the observations made on the height of the Avon, at Stratford-on-Avon. Since 1800 there had been only ten floods exceeding the height of 4 feet above the weir, and four of these were in 1875, in which year alone more than one flood had reached over 4 feet. Observations at Evesham, 16 miles lower down the river, gave nearly the same results, the slight difference probably being due to the tributaries which the Avon received between the two towns.

The enormous amount of damage and loss caused by these floods, suggested forcibly the question, "Can future floods be abated?" either by embanking, constructing storeage reservoirs, or lowering the water level. There was a prevailing popular demand that the flood waters of the upper Thames should be stored, but probably those who urged this did not realize the enormous amount of water to be dealt with. The reservoir storeage adequate to prevent floods on this river would have to be at least 160,000 million gallons, and owing to the Thames Valley being singularly destitute of good natural sites for reservoirs, their construction of adequate capacity would cost at least £15,000,000 sterling; this probably was a sufficient reply to the suggestion of storeage, regarded solely as a remedial measure against floods.

Considering that the health of the nation depended on the purity of its water supply, and considering the multitude of uses of water for manufacturing purposes, and the great pecuniary loss resulting from floods, it seemed remarkable that there was in England no central body charged with the supervision and

control of so important a matter. It was believed that, had a central department existed to receive information of the depth of the rainfalls, and with power to telegraph the information to local officers having the sluices, &c., under their absolute control, much of the recent damage might have been averted.

The quantity and quality of water were so frequently discussed together, that a few words upon the latter question might not be out of place. The purity of water supplied for drinking purposes was of the highest importance, but the extreme refinement of modern analysis had seemingly led chemists to set up a standard of purity in excess of the necessities of the case, for every source of supply, even deep well-water and mountain streams, had been objected to on some ground. Every one engaged in selecting a source of water supply looked out for the best obtainable at a reasonable cost; it could scarcely be expected that more should be done. Of the total supply probably not one-hundredth part was drunk, and not one thousandth part cold and unmixed with other ingredients. It was hard that nine hundred and ninety-nine parts must be of ideal purity for the other one that might be drunk, especially considering that the better class of domestic filters would remove everything injurious.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The iron departments of the leading works in this vicinity continue but poorly engaged, as a rule. At a few of the larger establishments there is a steady demand for small lots of hoops and ship plates, the latter being now in much better request than they were a few weeks back. The Midland Iron Company, whose works are at Rotherham, are now doing more business, probably, than any other local firm in hoop iron. They are putting down an additional hoop mill in order to cope with the demand. In other descriptions of merchant and finished iron, but little is being done, and that at prices which are scarcely higher than £7 15s. to £7 17s. 6d. for bars of the standard of, say, W. Cook and Co. Pig iron is again weaker, although I hear of several fairly good sales having been effected in both foundry and forge qualities during the past week or ten days. Many of the Derbyshire smelters have been unable to hold their footing here, and have, in consequence, been led to devote their competitive efforts to South Staffordshire, and some few parts of Lancashire. North Lincolnshire, Northamptonshire, and the Cleveland districts, supply us very fully with both pig and ore, and in return we in South Yorkshire send back the waggons with coal or coke. North Lincolnshire is being very rapidly and amply developed, for the most part under the fostering auspices of South and West Yorkshire firms or companies, and bids fair to become one of our most important sources of raw materials. At and near Frodingham, and Appleby there are already nearly a score of blast furnaces in operation, and three or four others are in course of construction. The ore of the locality is found to mix very well with the oolitic ironstone of Northamptonshire. The present prices of North Yorkshire pig iron (G. M. B.) are as under:—No. 1 foundry, 53s.; No. 2 foundry, 51s.; No. 3 foundry, 49s.; No. 4 foundry, 49s.; No. 4 forge, grey, 49s.; No. 5 forge, mottled, 48s.; No. 6 forge, white, 47s.; refined metal, 69s.; Kentledge, 58s.; and cinder pig, 39s.; all per ton for net cash.

The coal trade gets duller in all directions, and it is growing very evident that the wages of the miners will have to be again reduced before long. The output is greatly in excess of the demand at present, although four days is the average working time of the colliers of the district. Prices have been reduced by 6d. to 1s. per ton during the week.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

Business in the iron trade is reported slightly better this week, sheets especially being in rather stronger demand, chiefly on account of the Indian and South American markets; but, on the whole, trade is very flat, and prices are generally weak.

Rates are still upheld to some extent by the dearness of fuel, the prices at present ruling in South Staffordshire for forge coal being, it is stated, fully 15 per cent. higher than the same class of fuel commands in other iron-producing centres.

Bars of leading brands are still quoted at £10 per ton, but unmarked bars, though nominally quoted at £8 per ton, are readily obtainable at easier rates. For pig iron the market continues to be very adversely affected by the low rates prevailing in other districts; considerable quantities of iron are still coming into this district at fully 5s. per ton lower than the most favourable quotations of South Staffordshire firms. In this department the make continues to be restricted, and it is estimated that the weekly output of pig iron in this district is now about half the usual average.

There is now every prospect of an early reconstruction of the Conciliation Board for the adjustment of wages disputes. At a meeting of ironmasters held in Birmingham on Thursday last, the subject again excited considerable interest, and was discussed at length, when the following firms were duly elected to represent the employers on the proposed board:—Messrs. Groucutt and Sons, W. and G. Firmstone, W. Barrows and Sons, Chillington Iron Company, Limited, G. B. Thorneycroft and Co., New British Iron Company, P. Williams and Sons, Earl of Dudley, John Bagnall and Sons, Limited, N. Hingley and Sons, Osier Bed Iron Company, and Brown and Freer. The secretary was instructed to arrange for the election of a representative of the ironworkers at each of the iron-works on or before the 11th of March, who will forthwith proceed to nominate the twelve representatives for the standing committee, in accordance with the scheme which has already been submitted to the trade. When the standing committee is thus complete, they will proceed to the preparation of bye-laws and arranging details which will be subsequently submitted to the employers and employed. The men have so far very favourably received all the proposals which have been made in relation to the matter.

The coal trade rules dull, and the output is being very materially restricted at all the leading collieries; consequently stocks are yet comparatively light, all classes of fuel are pressed for sale, but buyers appear to operate with great caution, and decline to enter into contracts at current rates.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The depression which has characterized the coal trade of this district for the past couple of months continues, and all classes of round coal are difficult to move. Although there has been no general alteration in the list quotations this month, the actual selling prices are weaker, and so very irregular that it is difficult to arrive at what values really are. In the Wigan district, best Arley coal at the pit is quoted at 12s. 6d. to 13s. 6d. per ton; Pemberton four-feet at from 10s. to 11s. per ton; and common coal for iron-making purposes at from 7s. 9d. to 8s. per ton. Best coal in the Tyldesley district can be bought at 11s. per ton, and common coal at from 8s. to 8s. 3d. per ton. The present very limited production of engine coal, and especially slack, is causing a stiffness in this class of fuel, and, in some cases, circulars have been issued announcing advances of 3d. and 6d. per ton on slack, best qualities of which are now quoted at 4s. to 5s. per ton at the pit mouth in the Wigan district, and good burgy at from 6s. to 7s. per ton.

In the Manchester district stocks are accumulating in all directions, both at the pits and in the yards, and in other districts the collieries, as a rule, are only working about half time, whilst some of the common mines have been stopped altogether.

The meeting of South Lancashire colliery proprietors at Liverpool last Monday, to which I referred in my previous report, has left the wages question just as unsettled as ever; no agreement as to united action in the case of a strike could be come to, and the meeting broke up without anything definite being decided upon.

The coke trade continues very flat. Best Durham cokes delivered into this district are quoted at 23s. 6d. to 24s. 6d. per ton, and best Lancashire makes, for foundry purposes, can be bought at about 1s. per ton less.

There has been very little demand for iron during the past week, and, although one or two good orders have been placed, there is no general improvement in the market. There is a rather easier tone in local brands of pig iron, and Middlesbrough makes are offering in this district at very much lower prices—G. M. B. being quoted at 57s. 6d. for No. 3 foundry, and about 1s. less for forge qualities. For manufactured iron there is also very little inquiry, and quotations are about as under, for delivery into this district:—Middlesbrough bars, £7 12s. 6d. to £7 13s. 6d.; Lancashire, £7 15s.; Sheffield, £7 17s. 6d.; and Staffordshire can be bought for a trifle under £8. There is very little doing in the iron rail trade, in consequence of the low price at which steel rails can now be supplied, the best makes delivered into this district being offered at £7 15s. to £8 per ton.

The finished iron works are getting very short of orders; and in the general engineering trade there are complaints from all quarters of the falling off in work.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of the North of England shows no improvement. Business upon Newcastle Quay had not been so dull and flat for some years as it was last week. There was a talk on Saturday, if things did not mend soon, some of the miners employed at the Northumberland collieries would receive a fortnight's notice that their services would not be required, and possibly some of the pits may be laid in. Singular as it may appear, however, in the Tyne Dock, which is opposite the Northumberland Dock, where steam coals are shipped, no less a quantity than 34,000 chaldrons of coals were placed on board ship last week. The bulk of these were gas coals of various sorts. A good deal of gas coal was shipped for the South of Europe last week. The price of best gas coals remains about 10s. per ton, but second-class gas coals are put into the market at a much lower figure, and there was a tendency last week to a falling off of business. The ordinary household coals do not vary much in price, but there is less inquiry.

The freight market continues to favour the shippers. Steamers load coals for London at about 4s. 6d. to 4s. 9d., Rochester 4s. 9d. per ton; and the following quotations, which were current on the Tyne on Saturday, will give some idea of the coasting business for sailing ships:—London 5s. 9d., Poole 7s. 3d., Yarmouth 5s. 3d., for coals. But there were no orders in the market for two days last week for London. Very moderate figures are also paid for small vessels to load fire-bricks and other goods to the coast. As low as 7s. per ton has been paid small vessels to load bricks for Rochester, and 8s. per ton from Warkworth Harbour, with a free tow round. The continental trade is no better. Rates are very low for the Mediterranean. A considerable quantity of coal continues to be consigned to the Continent, not only from the Tyne, but from nearly all the ports on the east coast, including the Scotch and Yorkshire collieries. These coals are sold for what they will fetch on the other side, and foreigners, in very many instances, are paying from 1s. to 1s. 6d. per ton less than is paid for the same class of coals to be placed on board ship for the British ports. A very large amount of these shipments must be done at a loss. An order is being executed at Messrs. Palmer and Co.'s iron shipbuilding yard on the Tyne, which will be of considerable interest to gas companies, if the experiment should prove successful. Messrs. Palmer and Co., Limited, of Jarrow, are building three steamers, each of which will carry over 1000 tons of coals. These vessels are intended to be of a very light draught of water, and to go up creeks and shallow rivers, to discharge coals, which have hitherto only been accessible to small sailing vessels. As has been pointed out in this column before, there has been a difference of from 1s. 6d. to 3s. per ton between the rates paid to steamers to carry coals to the south of England and sailing ships; but not only is more money paid to small coasters than to steamers for carriage, but there is the uncertainty of arrival. It has long been felt that something of the kind which is now being attempted should be tried, and an excellent opportunity is afforded to make the experiment when iron and labour are very much cheaper than they have been for some time.

There is very little change in the position of affairs in the Cleveland and North of England iron trade. There is a fair inquiry for gas and water pipes and castings, but otherwise the finished iron trade continues in a very dull and lifeless state. The general manufacturing trade of the North of England shows little or no improvement. The chemical trade is very flat, and the manufacturers continue to be in a difficulty with the coopers, who refuse to follow the example of the other workmen, and submit to a reduction of 7½ per cent., or have the point in dispute referred to arbitration.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

At the Glasgow Town Council meeting last Thursday, the question of Sunday labour in the Corporation Gas-Works came up for consideration in connexion with the minutes of the Gas Committee. It was reported that a sub-committee had visited the different works, so as to enable them to say whether or not they could recommend any diminution of the present amount of work on Sundays. The report of the sub-committee said—1. That they found the work carried on, as to the manufacture of gas, in the same way on Sundays as on any other day, but none of the men usually employed in the taking in and storing of coals are employed. The total number of men employed in the 24 hours is 635 at present, and these are employed every Sunday. 2. That it is essential that the heats should be kept up in the retorts at all times, else they would crack, and great waste be caused, and, therefore, a certain number of men must be employed to keep up the fires, but that it is not necessary to manufacture gas on Sunday. The loss in so heating the retorts would amount to a considerable sum in coal or coke, besides the wages of the men required. 3. That the greatest quantity of gas consumed in 24 hours is about 9,982,000 feet, and the greatest consumption on Sunday is 5,258,000 feet in the 24 hours, or little over one-half. 4. That the gasholder power is considerably over one ordinary day's consumption at each of the stations—the total being 12,268,000 feet, against an average daily consumption of 9,000,000 feet. 5. That in the actual working there is a large quantity of gas made on Sunday, which goes to diminish the manufacture on the other days of the week. The sub-committee would give it as their opinion that there is no practical difficulty in the way of an almost entire cessation of the manufacture of gas on the Sabbath. The matter remitted is very much a money question; and although the loss by a cessation of manufacture on Sunday is estimated at about £2000 a year, they think the community generally would not grudge it for the attainment of such an object. They are of opinion that this loss would be largely compensated by the superior class of workmen they would be enabled to obtain. It was recommended, as an experiment, that the manufacture of gas should be stopped during the twelve hours on Sunday, from six o'clock in the morning till six o'clock at night, the men leaving off work at six o'clock on Saturday evening to begin work on Sunday at six o'clock in the evening, and the men leaving off work at six o'clock on Sunday morning to commence work on Monday morning at six o'clock, thus giving all the men 24 hours cessation from work, and that this arrangement should begin on the

1st of March, and should continue during the summer and autumn months. On the motion of Mr. Miller, chairman of the Gas Committee, the recommendations were approved. It is expected that a staff of about 100 men will be required between 6 a.m. and 6 p.m. on Sundays, and it is now estimated that the probable loss in consequence of the new arrangement will amount to about £3000 per annum.

The usual monthly meeting of the Dundee Gas Commission was held last week. A report was submitted by Mr. M'Crae, the manager, regarding the better supply of gas to the Lochee district, with a recommendation to erect a gasholder, of the capacity of 100,000 cubic feet, at a cost of about £5000, exclusive of the cost of the ground, which was approved of. There was a doubt as to the power of the commission to carry out the recommendation, without a new Act of Parliament; but it was eventually agreed to remit the consideration of the whole matter to the Works Committee. At the same meeting it was agreed to print, and circulate amongst the gas consumers, the suggestions lately made by Mr. M'Crae on the economic consumption of gas.

An improvement was reported to the meeting of the Town Council of Edinburgh, held last week, in respect to the illuminating power of the gas supplied to that city. Mr. J. Falconer King, the city analyst, said that the results of his examination of the gas, on the 23rd of February, showed that the Edinburgh Gas Company's gas had an illuminating power of 31·14 candles, and that the Edinburgh and Leith Company's gas showed 28·92 candles.

The people of Hamilton are congratulating themselves upon having the cheapest gas in Scotland. Not only do they get their gas, of fully 28-candle power, at 4s. 2d. per 1000 cubic feet, but they have upwards of 250 public lamps lighted free of charge.

At a meeting of the Motherwell Police Commissioners last week, it was agreed to negotiate a loan of £5000, as the first instalment of the cost of the new water scheme. A number of offers for the execution of the works were laid on the table, and remitted for the further examination of the burgh surveyor. The cost of the proposed works was estimated at from £15,000 to £18,000; but it is now considered probable that the works will be executed at even less than the smaller sum mentioned.

The Local Authority of Markinch, in Fifeshire, have applied to the Public Works Loan Commissioners for the loan of £15,000, the probable cost of the new water-works, which are about to be undertaken for the parish.

Mr. Campbell-Bannerman, M.P. for the Stirling Burghs, has presented a petition to the House of Commons against the water bill promoted by the Town Council of Dunfermline. It bore 2078 signatures. It is now known, however, that no opposition against the bill has been lodged in the Private Bills Office.

An inquiry into the proposed gravitation water scheme for the Irvine district was recently held in the Court House, Irvine, by Mr. W. A. Orr Paterson, sheriff-substitute for Ayrshire, at the direction of the Home Secretary, anent the application for a Provisional Order. Several objectors appeared from Lord Eglinton, the Glasgow and South-Western Railway Company, millowners, &c.; but their objections were mostly of a technical character, and after evidence had been led by the promoters of the scheme, the sederunt was adjourned for a fortnight, to give time for a proper understanding to be arrived at with the objectors.

Higher prices prevailed in the Glasgow pig iron market during the greater part of the past week. As high as 60s. 6d. cash was asked by sellers at the close of the market on Tuesday. On the following forenoon 60s. 4½d. and 60s. 3d. cash were paid, but on Friday the prices at which business was done had declined to 59s. 3d. and 59s. 4½d. cash.

No improvement seems to show itself in the Glasgow coal market, either as to price or number of orders. The present time has been a trying one for the coalowners, as all descriptions of coal are dull, and only saleable at prices below cost. The shipping trade is very inanimate, but it is expected that it may improve in the course of a short time.

Reductions in the Price of Gas.—The Darlington Corporation have reduced the price of gas from 3s. 6d. to 3s. 2d. from the beginning of the year. The Gas Committee of the Corporation of Bradford have reported to the Council in favour of a reduction of price from 3s. 6d. to 3s. 4d. A reduction has been made at Sutton-in-Ashfield of 5d. per 1000, from the 31st prox. At Winchester the price of gas will be reduced on the 1st prox. from 5s. to 4s. 9d.

Drogheda Gas Company.—The half-yearly meeting was held on the 24th ult.—Mr. P. Byrne in the chair. The report read by the secretary (Mr. W. Barker) gave a very satisfactory account of the position of the company, and recommended a dividend of 14s. per £11 share, and 7s. on each half share. The charge for gas is 5s. 10d. per 1000 cubic feet. The report was adopted, and the retiring directors and auditors re-elected.

Normanton Gas and Water Company, Limited.—The half-yearly meeting of shareholders was held on the 19th ult.—Mr. Slatter in the chair. The accounts showed that the affairs of the company were very prosperous, the profit for the half year amounting to £495 6s. 4d. Out of this the directors recommended the declaration of a dividend at the rate of 6 per cent., leaving a balance of £135 6s. 4d. to be carried to the reserve-fund, which already stood at £302. The accounts were adopted, the dividend declared, clear of income-tax, and the usual votes of thanks were passed.

King's Lynn Gas Company.—The annual meeting of shareholders was held on the 2nd inst.—Mr. Thew in the chair. The accounts presented showed the total receipts to be £6163 12s. 8d., and the expenditure £4962 4s. 4d., leaving a balance of £1201 8s. 4d. The chairman, in moving the adoption of the report, said the directors proposed to pay a dividend of 5 per cent. as compared with 3½ per cent. in the corresponding half year. This would absorb £800, and they proposed to carry £400 to the reserve-fund. Many of the shareholders of the company had expressed an opinion that they ought to have a reserve-fund, and he had much pleasure in stating that with the sum they now proposed to appropriate they would have £1400 for that purpose. Mr. T. E. Bagge seconded the motion, which was agreed to. The retiring directors and auditor were re-elected, and thanks were voted to the chairman.

Epping Water Supply.—Some years ago, on the Epping Local Sanitary Authority refusing to provide a new system of drainage and water supply, the Local Government Board stepped in and did the work, expending upon it the sum of £11,900. It turned out a failure, however, the supply of water obtained being very limited, while some of the sewers were admittedly constructed in such positions that it would be very costly to connect the houses with them. Under these circumstances the local authority refused to take the works over, and eventually the Local Government Board called in Sir Joseph Bazalgette, C.E., to report upon them. He has just done so, and on his recommendation the Local Government Board have offered the works to the ratepayers for £5000, being one-fourth the cost of the water-works and two-thirds the cost of the sewerage works. A meeting called to consider this offer has been adjourned for a fortnight.

Maidstone Water-Works.—At the annual meeting on the 22nd ult., the report of the directors showed that the water-rents during the past year amounted to about £4330. There was a profit for the year of about £1132, and the directors recommended that a dividend at the rate of 4 per cent. per annum, free of income-tax, upon the ordinary share capital of the company, should be declared, and that the balance, £332 8s., should be carried forward to the reserve-fund, which would then amount to £455 6s. 7d.; out of this fund they proposed to pay the cost of restoring the reservoir at Farleigh, at a cost of about £300. The report also stated that two filter-beds for the purpose of filtering the water supplied to the town had been in operation about three months, and had been found to answer perfectly; the cost had been about £1758 17s. 10d. During the year 1875 the directors had received £1550 further capital by the issue of 155 £10 preference shares, at an interest of 5 per cent. The report and balance-sheet were adopted, and Mr. S. Mercer, the retiring auditor, and Messrs. Ellis, Monckton, and Wigan, the retiring directors, were re-elected.

Trowbridge Water Company.—The ordinary general meeting of shareholders was held on the 24th ult.—Mr. S. Peed in the chair. The report stated there had been a clear profit realized of £393 8s. 7d. since the works were opened on Sept. 30, 1874, and the directors recommended a dividend of 1 per cent. on the consolidated stock, to be paid on the 1st of March, free of income-tax, leaving a balance of £143 8s. 7d. to be carried to the next revenue account. The exceptionally heavy fall of rain since the opening of the company's works, no doubt, accounted for the small consumption of water; but the directors, from their experience in connexion with other water-works, had full confidence in the undertaking, and had no doubt that when the great advantages of an abundant supply of pure and wholesome water, at high pressure, were better known, the company's business would correspondingly increase. The directors had at present been unable to complete the purchase of some of the additional property authorized to be purchased by the company's Act, but they trusted before the next meeting of shareholders to be in a position to report satisfactorily thereon. The report of Mr. H. Tomlison, the company's engineer, stated that, up to the present date, water from the company's works had been laid on to 441 premises, the income from 400 of these being £356 per annum. The remaining 41 services were supplied through meter, and the amount derivable therefrom was indefinite. The general condition of the company's works was satisfactory. The report of the directors was adopted, the dividend declared, and votes of thanks passed to the engineer, directors, and chairman.

Darlington Corporation Gas Supply.—At the meeting of the Darlington Town Council on the 2nd inst., the Gas Committee brought up a recommendation to the effect that the price of gas be reduced 4d. per 1000 cubic feet. In moving the adoption of the report, Alderman Kitching said that there had been £1140 interest paid out of the profit of gas. They had a profit remaining of £803; £650 had been paid in liquidation. The committee proposed to reduce the price 4d. per 1000 feet from the 1st of January, which was as much as they could recommend at the present time, inasmuch as it would reduce the price from 3s. 6d. net to 3s. 2d., which was the lowest that had ever been charged in the district. The 4d. reduction would make something like £655, which taken out of the net profit would leave a very small balance. Sixpence per 1000 feet reduction was thought of, but in consequence of certain repairs, which were contemplated, it was thought that 4d. was as much as they could afford. In answer to Alderman Luck, Alderman Kitching said that the cost of the gas used at the jubilee was included in the last half year. Mr. Luck then proposed that instead of 4d., the gas should be reduced 6d. per 1000—to 3s. They were paying off the interest and principal of the gas-works, and leaving the next generation the profit of it. Mr. Robson thought Darlington ought not to pay more than Stockton and Middlesbrough. Alderman A. Pease said that had it not been for the jubilee there would have been a profit of £1800. The town lamps were to be brought 4s. lower than before. He thought the price to consumers should be further reduced. Mr. Plews seconded Mr. Luck's amendment, which, on being put, was lost, and the report of the Gas Committee adopted.

Brighton Water Supply.—The Brighton Town Council having applied to the Local Government Board for sanction to purchase the works of the West Brighton Water-Works Company, Mr. A. Taylor, one of the inspectors of the Board, held the usual inquiry on such occasions, during the past week. The evidence showed that the corporation had entered into an agreement with Mr. Morris, the owner of the works, for the purchase for the sum of £27,500, to be paid in four instalments of £12,500, £5000, £5000, and £5000 as the rental increased, a proviso being made that the last payment should not become due until by statute Hove had become incorporated with Brighton. Mr. Easton, of the firm of Easton and Anderson, deposed to the engineering and other details of the works, and said that the property proposed to be taken did not consist of land or works—the corporation, who are already the owners of the water-works supplying the other parts of the town, having works of their own—but of all the mains, cocks, and hydrants laid down in every street which was either built or to be built in the western districts. It also included the sea-water works, consisting of a pumping station under the Esplanade between the King's Road and the sea, with the set of mains, which reached, however, only the houses on the West Brighton Estate proper. The pipes, cocks, and hydrants—in fact, what he might call the distributing apparatus only, which the corporation were to take—cost £7500, and were worth that now. It would cost the corporation that sum to put them down, and they were necessary whether the districts were supplied by Mr. Morris's works or by those of the corporation. He would have no hesitation in recommending the corporation to give £27,500 in a lump sum; but the terms made by them with Mr. Morris were far more favourable. Witness proceeded to explain that the £7500 would be represented in actual value by the distributing apparatus, and that the income derived from water-rates by Mr. Morris was £764 per year. The cost of working to the corporation would be £150 per year; making the net revenue £600 in round numbers. But, since that estimate was made, there had been an increase in the revenue, and the gross amount would not be less than £900 by the 30th of June, the time fixed for the corporation to pay the first instalment. By the estimates made by Mr. Barry and Mr. Vernon, whose figures were supplied to him, Mr. Easton said the gross income in 1878 would be £1069; in 1879, £2136; in 1880, £2603; and in 1881, £3436; but, as there was always an uncertainty about calculating the exact time at which such increment would take place, the arrangement was made for payment of the purchase-money as the income increased. The difference between the value of the distributing apparatus—viz., £7500 and the £12,500 to be paid in June next—was represented by the interest upon 20 years purchase of the income at the present time. Alderman Hallett said the agreement to purchase had been entered into by the corporation with a view to getting rid of opposition as well as to secure a good investment and shut out competition. He believed it to be a most beneficial arrangement for the corporation and had not the slightest doubt that the old water company, if they had had the opportunity, would have been glad to purchase Mr. Morris's works upon the terms which the corporation had made. The feeling in the town was, he was convinced, unanimously in favour of the purchase, for he had heard nothing against it. He was acquainted with the financial condition of the corporation with regard to their borrowing powers. They had power to borrow £450,000 in addition to mortgages which they had. When they bought the works of the old company for £321,156 11s. 8d., there was an existing mortgage of £27,000. The sum of £325,000 was borrowed to cover the expenses, leaving £125,000 borrowing powers. Since that the corporation had put up a new engine; in fact, they had duplicated their system, for which they had had a loan of £35,000, leaving a scope of £90,000. The corporation borrowed money upon very favourable terms, getting nearly all their loans at 4 per cent., and he had no doubt that they would be able to borrow the money for the purchase of Mr. Morris's works without difficulty. Mr. Gore, who appeared for certain ratepayers, submitted that the purchase was a bad one, and was not to be made *bonâ fide* for carrying out a water company, but to stifle a good measure for the extension of the Hove Commissioners jurisdiction. He also contended that the estimates were speculative and unreliable. No witnesses were called on this side, and the inquiry terminated, the inspector promising to make an early report to the Local Government Board.

New Pumping Machinery.—Our contemporary *Iron* gives an account of a recent visit of a number of scientific and practical gentlemen, interested in mining affairs, to the works of the Oakbank Oil Company, near Mid Calder, with

the object of inspecting some new pumping machinery which has been lately constructed there. This company have worked the Calder shale-field for many years, and the works for the distillation of oil, &c., cover an area of 26 acres. No less than 60,000 tons of shale per annum undergo the process of distillation, while 2 million gallons of crude oil are refined and manufactured into burning and lubricating oils and naphtha and paraffin wax for candles; while sulphate of ammonia is also extensively manufactured from the shale. At one of the most extensive of the shale-pits on the banks of a tributary of the Almond, near the village of Mid Calder, and which is 43 fathoms in depth, it was found necessary a few months ago to erect new pumping machinery to keep the working dry while working the lowest seam of shale, which is 4½ feet in thickness. The order was entrusted to Messrs. A. Barclay and Sons, of Kilmarnock, who have turned out machinery of novel construction, and which has been found to work with great efficiency. The engine, of the overhanging beam class, high-pressure and condensing, has a steam cylinder 62 inches in diameter, with a stroke of 8 feet, which gives a stroke of 10 feet in the pumps. The beam is made of solid wrought-iron plates, 30 feet long, consisting of two plates 1¼ inch thick, thoroughly bound together. The pump-rods are hung between these plates at the pit end, and the steam cylinder is just within the rods, the back ends of the beam being supported by a vibrating column. By this arrangement the pit head is perfectly accessible and unencumbered by machinery, the importance of which will be obvious. The engine is fitted with the most improved system of valve-gear, working two Cornish valves in the one steam-chest with the equilibrium valve between. The condenser is of the blow-through type so successfully applied by the engineers to the largest pumping-engines. It is claimed for this form of condenser that it has no working parts that will go wrong or require to be kept in repair, and that at all times it gives a steady vacuum in the cylinder. The pump worked by the engine is of a plunger class. The plunger is 27 inches diameter, working a 10-feet stroke, and weighs 8½ tons. The rods to which the plunger is attached are made of pitch pine 14 inches square, in lengths of 40 feet, bolted together at each joint by four malleable iron plates, 20 feet long. The rising column of pipes are 22 inches in diameter. Before being sent to the pit, all the pipes, clack pieces, and working barrel were tested in Messrs. Barclay's works to a pressure of 450 lbs. to the square inch. The heavy weights which had to be lowered down the pit necessitated the use of a very powerful crane, which was also constructed by Messrs. Barclay and Sons, and has been fixed permanently on a stone seat for future use in connexion with the pit; and this crane is capable of lifting 20 tons as a working load, but has been tested considerably above that point. It is driven by a single 8-inch cylinder, working with screw and worm wheel on the first motion, and reduced with spur gearing to the drum. The drum is 54 feet diameter supported on three strong cast-iron rings, and covered with wood cleading. The rope is 6½ inches in diameter. The total weight of the material in connection with the pump in the pits is about 150 tons, and of the engines above ground 70 tons. The power of the machinery may be estimated from the fact that 1500 gallons of water can be discharged per minute from the pit into the adjoining streams. The visitors inspected, while at the works, the various processes of distillation, and among other matters of interest, the retorts invented and patented by Mr. Henderson. Several of these have been erected and are working satisfactorily. They are considered a great improvement on the old vertical retorts, inasmuch as the spent shale, formerly considered useless, is applied to heating purposes, by utilizing the carbon contained in the material. Mr. Beilby's invention for the utilization of the acid tar for making ammonia also came in for a share of attention. By a mechanical arrangement, the water issuing from the works is now separated, all that contains deleterious or chemical matter being diverted from the stream, the clean water only flowing into it. One result of this is said to be that trout are now as plentiful in the stream as before the works were commenced.

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

796.—Brewer, E. G., Chancery Lane, London, "A new or improved pump." A communication. Feb. 25, 1876.

799.—Howard, J., Peckham, London, "Improvements in automatic apparatus for regulating the flow of fluids under pressure, and prevention of waste of water." Feb. 26, 1876.

831.—M'Evoy, C. A., Piccadilly, London, "Improvements in gas lighting apparatus." Feb. 28, 1876.

832.—Jenkin, F., Edinburgh, "Improvements in apparatus for regulating the flow of fluids." Feb. 28, 1876.

842.—Jensen, P., Chancery Lane, London, "Improvements in liquid and fluid meters." A communication. Feb. 29, 1876.

847.—Elliott, A., and Burnett, C., Stockton-on-Tees, "Improvements in actuating regulating valves for steam, water, gas, and other purposes." Feb. 29, 1876.

Share List of Metropolitan Gas and Water Companies.

(Corrected by Mr. F. N. Golding, *Sun Court, Cornhill, from the latest Stock Exchange Quotations.)*

Number of Shares issued.	Amount per Share.	Name.	Amount paid up per Share.	Last Divd. p.Cent. p. Ann.	Latest Quotations.
	£	Gas Companies.	£ s. d	£ s. d	£
8000	20	Anglo-Romano . .	20 0 0	10 0 0	14—16
5000	20	Bahia (Limited). .	20 0 0	..	10—10½
1000	20	Do., preference .	20 0 0	..	23—25
1000	20	Do., do., redeem.	20 0 0	..	20—22
1500	20	Do., perpet. pref.	20 0 0	7 10 0	19—21
40000	5	Bombay (Limited).	5 0 0	7 0 0	7¼—7¾
10000	5	Do., fourth issue.	4 0 0	7 0 0	1½-2 pm.
10000	20	British (Limited) .	20 0 0	10 0 0	38—40
7500	20	Cagliari (Limited).	20 0 0	5 0 0	16—18
550000*l.*	Stk.	*Commercial*	100 0 0	10 0 0	199—201
20000	20	Continental Union.	20 0 0	8 0 0	23-23½xd
20000	20	Do., new	12 10 0	8 0 0	1½-2½pm.
10000	20	Do., preference .	20 0 0	7 0 0	26—28
5000	10	*Crystal Palace Dis.*	10 0 0	10 0 0	19—20
5000	10	Do., preference .	10 0 0	6 0 0	13—14
10000	7	Do., ordinary . .	10 0 0	7 0 0	13½—14½
2500	10	Do., converted .	2 0 0	10 0 0	1½-2 pm.
2300	7	Do., converted .	2 0 0	7 0 0	1-1½ pm.
23406	10	European(Limited)	10 0 0	10 0 0	16½—17½
12000	10	Do., new shares.	7 10 0	10 0 0	5-5½ pm.
35406	10	Do., new shares .	5 0 0	10 0 0	3½-4½pm
222856	10	*Gaslight & Coke A.*	10 0 0	10 0 0	20½—21
10000	10	Do. B.	10 0 0	4 0 0	8—8½
703	10	Do. 5 per ct. pref. conv., 1st issue.	10 0 0	5 0 0	18½—18¾
627	10	Do. do., 2nd do. .	10 0 0	5 0 0	18½—18¾
30000	10	Do. do., 3rd do. .	10 0 0	5 0 0	19—20
50000	10	Do. do., 4th do. .	4 0 0	5 0 0	5—5¼
50000	10	Do. 5th do. .	2 0 0	..	4¼-4¾pm
20000	10	Do. C 10 p.c. pref.	10 0 0	10 0 0	22½—23½
12000	25	Do. D do. do. .	25 0 0	10 0 0	56—58
6200	5	Georgetown, Guiana	5 0 0	5 0 0	
5000	10	Hong Kong (Lim.)	10 8 0	10 0 0	15—16
15000	100	*Imperial*	100 0 0	10 0 0	203—205
78000	12½	Do., new shares .	12 10 0	7 0 0	18½—19
1300	100	Do., bonds . . .	£100	10 0 0	210—220
56000	50	*Impri. Continental*	43 15 0	9 5 6	78—80
3000	40	*Independent* . . .	40 0 0	10 0 0	82—84
3000	10	Do.	10 0 0	5 0 0	9½—10½
3000	20	Do.	20 0 0	7 10 0	30—32
4500	10	Do., D	10 0 0	..	19—20
3783501.	Stk.	*London*	100 0 0	10 0 0	198—201
1500001.	Stk.	Do., 1st pref. . .	100 0 0	6 0 0	127—130
4350	Stk.	Do., 2nd pref. . .	100 0 0	6 0 0	
4350	Stk.	Do., 3rd pref. . .	100 0 0	6 0 0	
7622	25	Do., A shares . .	12 10 0	6 0 0	
268051.	All	Do., Debent. stk.	100 0 0	5*l.* & 6*l.*	
15000	5	Malta & Med.(Lim.)	5 0 0	2 0 0	2½—3
6000	5	Do., preference .	5 0 0	7 10 0	4½—5½
20000	5	Mauritius(Limited)	2 0 0	..	1½—1¾
25000	20	Monte Video (Lim.)	20 0 0	8 0 0	19—21
8000	10	Nictheroy, Brzl.(L.)	10 0 0	..	
17500	10	Pará (Limited) . .	10 0 0	7 0 0	4—4¼
27000	20	*Phœniz*	20 0 0	10 0 0	40—42
3600001.	100	Do., new	55 0 0	7 10 0	86—88
1440001.	Stk.	Do., capitalized .	100 0 0	5 0 0	102—104
36000	20	Rio de Janeiro (L.)	20 0 0	10 0 0	31—33
7359	5	Singapore(Limited)	5 0 0	7 10 0	5½—5¾
2000	5	Do., preference .	5 0 0	7 10 0	5¾—6
1500	32½	Shanghai	32 10 0	12 0 0	30—32
4000	50	*South Metropolitan*	50 0 0	10 0 0	102—105
4000	12½	Do.	12 10 0	10 0 0	24—27
20000	12½	Do., new shares .	5 0 0	10 0 0	10—11pm
15000	10	*Surrey Consumers.*	10 0 0	10 0 0	19—20
10000	10	Do., new	8 0 0	10 0 0	8—9pm.
9000	4	Unit. Gent., Limrck.	4 0 0	2 10 0	2—2¼
1500	10	*Wandsw. & Putney*	10 0 0	10 0 0	14—15
1500	10	Do.	10 0 0	7 10 0	11—12
2957	10	Do.	10 0 0	7 0 0	
993	10	Do.	3 0 0	7 0 0	
16000	5	*West Ham*	5 0 0	10 0 0	7¾—8
10000	5	Do., new shares .	2 10 0	10 0 0	3—4
		Water Companies.			
12000	100	Chelsea	100 0 0	6 0 0	141—143
1800000	100	East London . . .	100 0 0	6 0 0	141—143
8000	50	Grand Junction . .	50 0 0	7 0 0	80—82
5840	25	Do., ½ shares . .	25 0 0	7 0 0	40—41
2160	25	Do., new ditto; max. div.,7½ p.c.	25 0 0	7 0 0	35—36
4296	100	Kent	100 0 0	6 10 0	150—155
5339	100	Lambeth	100 0 0	6 5 0	145—148
1161	100	Do.	20 0 0	6 5 0	
442	100	New River	100 0 0	8 0 0	170—180
4475	100	Do.	30 0 0	8 0 0	50—55
400000	100	Do., deb. stk., 4 p.c.	100 0 0	4 0 0	97—99
3036	100	Southwrk. & Vauxh.	100 0 0	5 5 0	114—116
1296	100	Do., pref. stock .	100 0 0	5 0 0	108—110
	100	Do., D shares . . .	100 0 0	5 5 0	111—113
		Do.	..	4 10 0	
		Do., new ordinary	..	4 10 0	
1600	100	Do., new ord. No. 1	40 0 0	4 10 0	113—114
12172	61	West Middlesex . .	61 0 0	6*l.* p.sh.	132—134

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

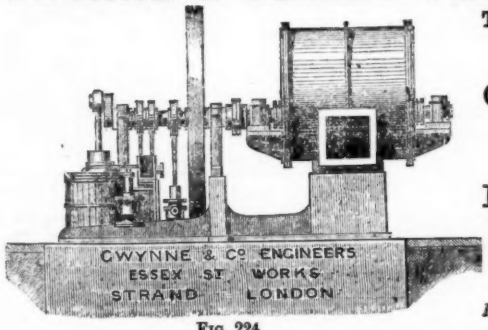


Fig. 224.

The BEST EXHAUSTERS IN THE WORLD.

GWYNNE & CO.

HAVE MADE THE

LARGEST AND MOST PERFECT

EXHAUSTING MACHINERY

Ever produced, and the most economical in working.

Prices and every information on application.

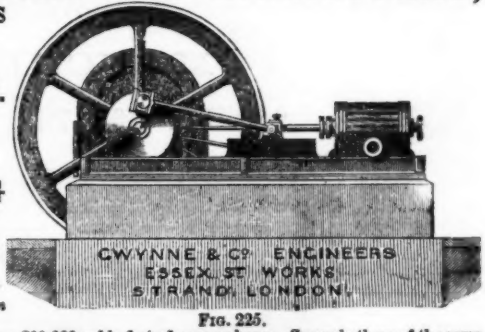


Fig. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the most perfect system of action yet discovered. Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. Gwynne and Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the excellence of the article produced, and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,

CAN BE HAD ON APPLICATION TO

GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.

G. & Co. are now manufacturing for a London Gas Company three of their 210,000 *cubic feet Patent Gas Exhausters, and many of all sizes.*

SULPHATE OF AMMONIA.

WANTED, a situation as Maker. Well up in both direct and tower processes. Could superintend erection of plant. Would not object to go abroad.
Address AMMONIA, care of WM. Whitthread, 34, Moorfields, LIVERPOOL.

WANTED, by a Working Manager of a Gas-Work, a SITUATION. Can do main and service laying, meter fixing, gas-fitting, setting of retorts, clay or iron. Twelve years testimonials. Abroad preferred.
Address No. 244, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a steady and sober Man, capable of taking charge of a small Gas-Work, where the annual make is about 5 millions. He must be competent to fix meters, lay services, and understand thoroughly the routine of gas making.
Apply to Mr. PENNY, 20, Abingdon Street, WESTMINSTER.

WANTED, by the Advertiser, aged 29, who has had nine years experience in Gas-Works, a situation as GAS-FITTER, Main and Service Layer, Meter Repairer, &c.
Address H., care of Captain Kenshett, Basin Road, Chichester, SUSSEX.

WANTED, a thoroughly competent Man as WORKING MANAGER for a Gas-Work making 2½ millions per annum. Wages 30s. per week. House, coals, and gas. No fitter need apply.
Applications, by letter only, to T. DYNE STEEL, C.E., Bank Chambers, Newport, MON.

TO GAS AND WATER WORKS ENGINEERS.

WANTED, by an Engineer and Con- tractor, who manufacturers all his own plant, a thoroughly practical MAN, to take the chief management of his business. Good commercial knowledge, as well as engineering skill, indispensable. Salary £250 a year, with a good house.
Apply, with references, to No. 253, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHIEF FOREMAN WANTED.

WANTED, at once, in a Metropolitan Gas-Work, a thoroughly competent and steady MAN. One who has already had the charge of a Gas-Work preferred. No one need apply unless he can produce testimonials testifying to his efficiency as regards purification and carbonizing. It is requisite that he should be a good penman, and have some knowledge of chemistry.
Address, stating age, with copies of testimonials, in own handwriting, to No. 252, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS MANAGER.

WANTED, a thoroughly competent person to undertake the practical MANAGEMENT of the Glossop Gas-Works. Annual production 33 million cubic feet.
Applications, in candidate's own handwriting, accompanied by testimonials, stating age, experience, and salary required, to be sent in not later than Saturday, the 11th of March, 1876, addressed to the CHAIRMAN of the Glossop Gas Company, GLOSSOP, and endorsed "Application for Gas Manager."

WANTED, second-hand Annular Con- DENSERS, SCRUBBERS, and PURIFIERS, large enough to pass about 100,000 feet of gas per diem.
Send price and particulars of each separately to DAVID WHITE, Water and Gas Works, Bangor, CARNARVONSHIRE.

WANTED, GAS-WORKS ON LEASE.

A MANAGER, of many years experi- ence, wishes to LEASE a small Gas-Work. A fair interest will be given.
Address No. 249, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

PUPIL WANTED.

A London Gas Engineer, having charge of extensive Gas-Works in the Metropolis, is in want of an intelligent Youth as PUPIL. A good opportunity will be afforded for learning practical Engineering and Gas Manufacture, as also the Chemistry of Gas Lighting, Drawing, &c. A premium will be required.
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ADVANTAGES OF GAS FOR

COOKING AND HEATING.

HINTS ON GAS BURNERS, &c.

By MAGNUS OHREN, A.I.C.E., F.C.S.

Specimen Copy by post Threepence, direct from MAGNUS OHREN, Gas-Works, Lower Sydenham, London, S.E.

ON SALE, cheap, Four second-hand PURIFIERS, 10 ft. square, with dry centre-valve and lifting gear. Thorncliffe make.
Apply to Mr. LONGWORTH, Dukinfield, MANCHESTER.

FOR SALE, in consequence of enlarge- ments, Four PURIFIERS, each 6 ft. square, 3 ft. deep, with 9 inches of a lute, centre-valve, and all connexions complete, and made by Hanna, Donald, and Wilson, of Paisley.
Apply to MANAGER, Corporation Gas-Works, LIMERICK.

FOR SALE, in consequence of enlarge- ments, Two PURIFIERS, 6 ft. square, with valves grids, covers, and lifting crane complete. Also Vertical Condenser, 8-in. pipes and chest, in good order.
Apply to W. EWART, Gas-Works, ANNAN, N.B.

TO CORPORATIONS, GAS COMPANIES, & OTHERS.

TO BE DISPOSED OF, by Private Con- tract, 100 perfectly new, and never used, cast-iron fluted pattern public LAMP COLUMNS; 200 tinned copper Public Lamps, and 70 wrought-iron ornamental scroll pattern Lamp Brackets, all complete.
For particulars as to price, &c., apply to J. L. COCKER, Gas-Works, Merthyr Tydfil, GLAMORGANSHIRE.
Feb. 21, 1876.

FOR SALE—A 6-in. Governor, in good condition. Now replaced with a larger one.
Apply to Mr. W. DUFF, Manager, Gas-Works, MORECAMBE.

SECOND-HAND STATION-METERS.

TO BE SOLD, a Station-Meter, now in use, to pass 60,000 cubic feet of gas per hour, made by W. Sugg about eight years ago; to be replaced by a meter of larger capacity.
Also a Station-Meter 8 ft. square, to pass 15,000 cubic feet of gas per hour, with clock tell-tale index, valves, and connexions, wheel nearly new.
Apply, for particulars and prices, to the Gas-Meter Company, Limited, 238, Kingsland Road, LONDON, or Union Street Meter-Works, OLDHAM.

THE Sheffield United Gaslight Company have for SALE the following Articles:—
The whole Manufacturing Plant, Gasholder, and Governor, of a small Gas-Work, capable of producing 10,000 cubic feet of gas per day. The gasholder is 27 ft. diameter by 14 ft. deep, cubic contents 8000 ft.
Connexions for ditto.
Four Purifiers, 12 ft. square, with 10-in. centre-valve and connexions.
Two Jones's Exhausters, each to pass 25,000 cubic feet per hour, with valves and connexions, in good condition.
Two 7-in. Governors.
One Battery Condenser, 60 ft. long, 12 ft. high, and 2 ft. wide, with 14-in. connexions and valves.
Seven Lengths Hydraulic Main, 7 ft. long, 18 in. diameter.
Nine Lengths Hydraulic Main, 7 ft. long, 14 in. diameter.
Twenty-seven Dip-Pipes, 4 in. diameter.
Twenty-seven Bridge-Pipes, 4 in. diameter.
Full particulars as to quality and price can be obtained on applying to Mr. T. ROBERTS, the Manager, Commercial Street, SHEFFIELD.

LOCAL BOARD FOR THE DISTRICT OF NORTHFLEET.

TENDERS FOR LAMP-POSTS AND FITTINGS, AND ERECTIONS THEREOF.

THE Board being about to light the streets of their district with gas, invite TENDERS for the supply and erection of over 100 LAMP-POSTS and FITTINGS complete, as per specification lying at our Offices, a copy of which may be had on application.
Length of standards about 10 ft. from ground line; 16-in. lamp. Drawing of patterns must accompany tender.
Tenders, marked "Gas Tenders," must be delivered at our Offices before Four o'clock p.m., on Wednesday, the 15th day of March inst.
The lowest tender will not necessarily be accepted.
The contractor must be prepared with sufficient security for the due execution of the contract.
SHARLAND AND HATTEN, Clerks to the Board.
King Street, Gravesend, March 1, 1876.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

D. BRUCE PEEBLES & CO.,

ENGINEERS,

FOUNTAINBRIDGE WORKS, EDINBURGH,

MANUFACTURERS OF WET AND DRY GAS-METERS;

Patentees and Sole Manufacturers of PEEBLES' LAMP-GOVERNORS,

ABOVE 30,000 OF WHICH ARE NOW IN USE.

"These Lamp-Governors are so superior that they are likely to supplant all others."—*Dr. Wm. Wallace, F.R.S.E., F.C.S.*

D. BRUCE PEEBLES AND CO., FOUNTAINBRIDGE WORKS, EDINBURGH.

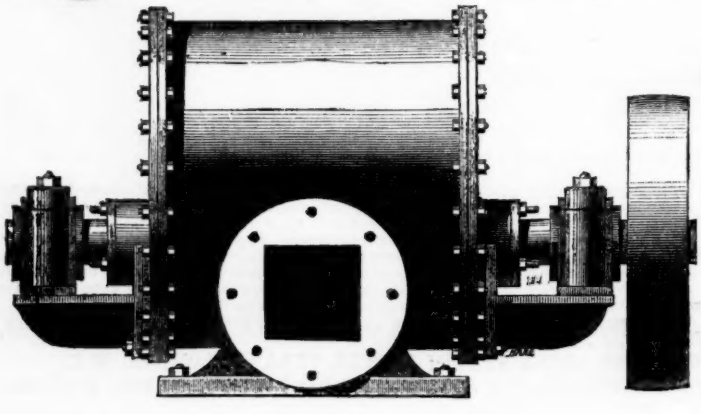
AWARDED SILVER MEDAL

AT THE

MANCHESTER EXHIBITION

OF THE

"SOCIETY FOR THE PROMOTION OF SCIENTIFIC INDUSTRY."



BEALE'S

Improved Patent

GAS-EXHAUSTERS.

Since the retirement of Mr. BEALE, the Oldest Makers are

GEORGE WALLER & CO.

Makers of ENGINES, EXHAUSTERS, INDEX and DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, and other PUMPS, SCRUBBERS and PURIFIERS, CONDENSERS, BOILERS, &c.

PHŒNIX ENGINEERING WORKS, HOLLAND ST., S.E.,

AND

STROUD, GLOUCESTERSHIRE.

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im-portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

They are, in all cases, constructed under guarantees to perfectly perform their work. They are now extensively used in the largest gas-works of London and the chief cities of Europe, the number in use exceeds **one hundred,** and their perfect efficiency and profit to a gas company have been fully established with every variety of coal used in Europe. References can be given to the largest gas-works in Europe.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, re-quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Carlisle Corporation Gas Committee are prepared to receive TENDERS for the surplus TAR to be produced at their works, during a term of Three, Five, or Seven years, commensing July 1, 1876. The Tar may be delivered into tanks on rails.

Any further information can be obtained from the undersigned, to whom sealed tenders, endorsed "Tender for Tar," are to be sent on or before March 9, 1876.

J. HEPWORTH, Manager.

Gas-Works, Carlisle, Feb. 12, 1876.

THE Gas Committee of the Corporation of Birmingham are prepared to receive TENDERS for the purchase of the SPENT OXIDE produced at their several works in Birmingham and at West Bromwich, for Twelve months, from the 1st of May next.

The quantity is estimated at from 2000 to 3000 tons per annum.

Tenders to be addressed to the Works Committee, not later than the 31st of March.

Further particulars may be obtained on application to the Secretary.

By order of the Gas Committee,

HENRY PARRY, Secretary.

Gas Offices, Old Square, Birmingham, March 1, 1876.

TO GASHOLDER MAKERS AND OTHERS.

THE Directors of the Spennymoor and Tudhoe Gas Company, Limited, are prepared to receive TENDERS for the construction and erection, complete, of the INNER LIFT of a Telescopic Gasholder, 78 ft. diameter and 22 ft. deep, in accordance with plans and specification, which may be seen, and further particulars thereof be obtained, at the Office of the Company.

Tenders, sealed and endorsed "Tender for Gasholder," to be sent in not later than Saturday, the 18th day of March, 1876, addressed to Mr. ROBERT PRUDHOE, Secretary, Gas Company, SPENNYMOOR.

The tender lowest in price will not necessarily be accepted on that account.

TO GASHOLDER MAKERS, IRONFOUNDERS, &c.

THE Directors of the Prescot Gas Company are prepared to receive TENDERS, with plans and specifications, for a Telescope GASHOLDER, 40 ft. diameter, 16 ft. deep. Also for a Single-Lift GASHOLDER, 60 ft. diameter, 20 ft. deep, with the necessary columns, guides, girders, valves, and pipes complete, and to be erected at their works.

For further particulars apply to the undersigned.

Tenders for each to be sent in not later than Saturday, March 18, 1876.

The Directors do not bind themselves to accept the lowest or any tender, nor will any allowance be made for plans and specifications.

WILLIAM PRESCOTT, Manager.

Prescot Gas-Works, Feb. 23, 1876.

TO GASHOLDER MAKERS, IRONFOUNDERS, &c.

THE Directors of the Rhyl Gaslight and Coke Company, Limited, are prepared to receive TENDERS for the construction of a Single GASHOLDER, 60 ft. diameter and 18 ft. deep, with columns and girders complete.

Plans and specification may be seen on application to the Engineer, Mr. F. J. Collingwood, Rhyl, or at the Offices of the Company, High Street, Rhyl.

Sealed tenders to be addressed to the Chairman, Gas Company, Rhyl, and delivered not later than the 15th day of March, 1876, endorsed "Tender for Gasholder."

The Directors do not bind themselves to accept any tender.

MILES R. PARTINGTON, Secretary.

39, High Street, Rhyl, Feb. 25, 1876.

BRISTOL UNITED GASLIGHT COMPANY.

SPECIFICATION AS TO SUPPLY OF COALS.

THE Directors of the Bristol United Gaslight Company invite TENDERS for the supply of from 90,000 to 100,000 tons of GAS COALS, during the Twelve months between the 1st of May, 1876, and the 1st of May, 1877, for use at the works, situate respectively at Avon Street, St. Philip's, and Canons' Marsh, Bristol.

The Coal to be partly small and partly large or brush, and to be delivered in such monthly proportions as may be required in accordance with the season. The quality of the coals must be good, dry, and free as possible from sulphur, bats, binds, refuse, and dirt.

Full particulars required of the Coals for which tenders may be submitted, and the Directors will be glad to receive chemical analyses thereof, and any information in relation to their properties for the manufacture of gas.

Parties tendering must state the maximum quantities of either small, large, or brush Coal they will undertake to deliver monthly, and it must be understood that the Directors are to be at liberty to accept the terms offered for any lesser quantities they may think fit.

Tenders to state the prices per ton f.o.b. (port of shipment to be named), or delivered at Railway Station, Bristol, or at the Company's Gas-Works, Avon Street or Canons' Marsh, and discount for cash monthly payments.

Payment will be made in accordance with the weight (20 cwt. to the ton), as weighed upon the weigh-bridge of the Gas Company at their respective stations.

Sealed tenders to be addressed to the Chairman of Directors, Bristol United Gas Company, Canons' Marsh, Bristol, marked "Tender for Gas Coal," and delivered not later than Tuesday, the 28th of March inst.

HENRY H. TOWNSEND, Secretary.

Gaslight Offices, Bristol, March 3, 1876.

SPONGY IRON FOR THE PURIFICATION OF GAS AND WATER.

BROOKE, SIMPSON, AND SPILLER, of 50, Old Broad Street, E.C., have purchased a patent for, and commenced the manufacture of, this product, and are prepared to enter into contracts for delivery.

Now ready, price 7s., by Post 7s. 3d.,

A SECOND EDITION (fcap. 8vo., morocco gilt)

OF

THE GAS MANAGER'S HANDBOOK,

CONSISTING OF

Tables, Rules, and Useful Information for Gas Engineers, Managers,

And others engaged in the Manufacture and Distribution of COAL GAS.

BY THOMAS NEWBIGGING, A.I.C.E.

WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

ALFRED WILLIAMS,

PHŒNIX FIRE-BRICK WHARF,

64, BANKSIDE, SOUTHWARK, LONDON, S.E.

GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,

AND FOR THE

SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,

AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.

CLYDE TUBE WORKS, GLASGOW & COATBRIDGE.

OFFICES, 41, OSWALD STREET, GLASGOW,

ANDREW & JAMES STEWART,

MANUFACTURERS OF

WROUGHT-IRON WELDED TUBES AND FITTINGS,

GUN METAL & OTHER COCKS, ALL KINDS OF IRON & BRASS FITTINGS

For GAS, WATER, and STEAM;

CAST-IRON PIPES, CORE BARS for IRONFOUNDERS,

STOCKS, DIES, and TAPS, GAS PLIERS and TONGS, &c., &c.,

ALWAYS KEPT IN STOCK.

LAP-WELDED IRON BOILER TUBES,

As supplied to the English, French, and Dutch Admiralties, and principal Railways and Engineers at Home and Abroad.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES,

CHANDELIERS, BRACKETS, &c.,

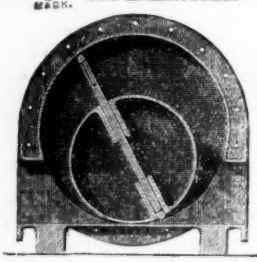
And every description of Gas-Fittings and Gas Apparatus.

TRADE MARK.

J. BEALE'S

PATENT

GAS EXHAUSTER.



BEALE'S CONTINUOUSLY ACTING

GAS EXHAUSTERS

ARE NOW MANUFACTURED BY

B. DONKIN & CO.

MR. J. BEALE, of East Greenwich, having retired from business, has made an arrangement with B. DONKIN & CO. for the sole manufacture of his Patent Solid-Slide Gas Exhausters.

B. D. & Co. also make Steam-Engines to drive Gas Exhausters direct or otherwise, and Gas-Valves.

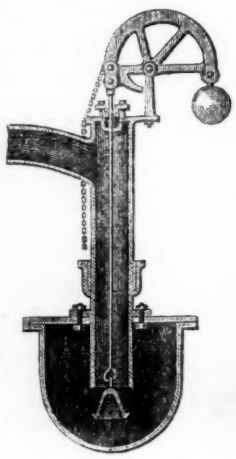
Estimates and Prices on application to

B. DONKIN & CO.,

ENGINEERS & IRONFOUNDERS,

55a, BLUE ANCHOR ROAD, BERMONDSEY,

LONDON, S.E.



BOX'S

PATENT ANTI-DIP VALVE

Affords a clear gas way through the dip-pipe while the retort is in action, and produces a perfect seal at pleasure, or whenever the retort is open, offering absolute security against the drawing of air, however hard the engine is worked, and obviating the necessity for using any liquid in the now so-called hydraulic main, while it is at the same time capable of withstanding the heaviest back pressure. By its use, experience shows that the retorts are kept quite free from carbon. It is easy of application to existing apparatus, and is comparatively inexpensive. Is not likely to get out of order, as the tar, which will adhere to the bottom of the dip-pipe and the flange of the cone, both of which are faced, will act as a lubricant, and prevent undue wear and tear. The whole, as will be seen on inspecting the accompanying illustration, is exceedingly simple, and every part accessible. To adapt it to the present dips, all that is necessary is to face the bottom edge of the dip-pipe, and suspend a cone by a rod, which passes through the bonnet, the raising and lowering of the cone being performed through the intervention of a weighted eccentric and chain.

The Patentee will be glad to show a number of the Patented Apparatus in action, is prepared to supply them upon the most moderate rerms, and will be happy to reply to any inquiries that may be addressed as under—

W. BOX,

GAS-WORKS, CRAYFORD, KENT.

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.

B. GIBBONS, JUN.,

DIBDALE FIRE-CLAY, BRICK, AND GAS-RETORT WORKS,

STOURBRIDGE (Established 1834),

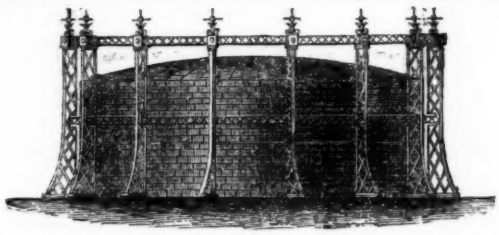
MANUFACTURER OF EVERY DESCRIPTION OF

Burs, Lumps, Stays, Shields & other Bricks, & Gas-Retorts.

A LARGE QUANTITY OF RETORTS ALWAYS IN STOCK.

Circular . 14 in., 15 in., 16 in., 18 in.
Ovals . . 17 in. × 14 in., 17 in. × 15 in., 20 in. × 15 in., 21 in. × 15 in., &c.
D's. . . { 14 in. × 14 in., 15 in. × 12 in., 15 in. × 13 in., 17 in. × 14 in., 18 in. × 13 in.
{ 18 in. × 15 in., 20 in. × 16 in., 22 in. × 14 in., 24 in. × 14 in., 24 in. × 15 in., &c.

Special attention given to the execution of Export Orders.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

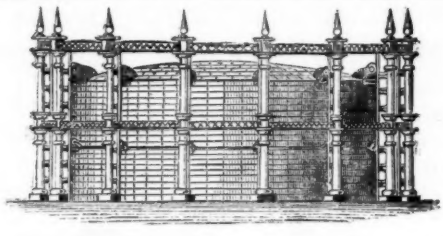
AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

HOPE IRON WORKS,



STOCKTON ON TEES.

ASHMORE & WHILE,

GAS ENGINEERS & CONTRACTORS,

MANUFACTURERS OF GASHOLDERS,

GAS APPARATUS OF EVERY DESCRIPTION,

Including Improved

Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,

And GENERAL IRONWORK.

N.B—Estimates for all Gas Plant and Remodelling supplied on application.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

Mr. ALFRED LASS,

60, CORNHILL, LONDON, E.C.,

Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.

To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.

To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

D. M. NELSON,

48, GORDON STREET (late 135, BUCHANAN ST.),

GLASGOW.

Supplies every requisite in connexion with the distribution of Gas and Water.

Estimates and prices on application.

WOOD GRIDS for Purifiers and Scrubbers.

Cast-Iron PIPES and VALVES.

Street LAMP-PILLARS.

Patent Pipe SCREWING-MACHINES, &c.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

COST PRICE SHEETS.

MANUFACTURE AND DISTRIBUTION OF GAS. These sheets are the same as were laid before the Dublin Meeting of the British Association of Gas Managers; but in the REPRINT, NOTES have been added for the guidance of those using them. Copies of the two sheets may now be had, price 5s.

South Shields. W. J. WARNER.

TO GAS & WATER COMPANIES, & MUNICIPAL AUTHORITIES SUPPLYING WATER OR GAS.

CONSPIRACY AND PROTECTION OF PROPERTY ACT, 1875.

It is required, under a PENALTY OF FIVE POUNDS, that a PRINTED COPY of the 4th SECTION of the above Act shall be posted up at all Gas and Water Works in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of the section, in large type, on broad sheets, may be had of WILLIAM B. KING, 11, Bolt Court, Fleet Street, LONDON. Price, per post, 2s. per dozen, or 10s. 6d. per 100.

The Act came into operation on Sept. 1, 1875, and extends to Scotland and Ireland.

BAILEY'S Patented Inventions are now in extensive use wherever steam is known. Bailey's Patent Steam Gauges, Pyrometers, Water Gauge Cocks, Test Pumps, Fusible Plugs, Steam and Water Valves, Safety Valves, Junction Valves, Pumps, Tell-Tales, Recorders, Lightning Conductors, Electric Telegraphs, Turret Clocks, Steam Joint Cement, Lifting Jacks, Boiler Feeders, Lime Catcher and Separator, Injectors and Ejectors, and every description of first-class Brass Work for Engines and Boilers. Gas-Works Managers who have not our large book should send for it.

16th edition, 1000 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000,

BAILEY'S Illustrated Inventions, containing details and prices of goods in our five several departments:—(1) Brass Foundry, Steam Gauges, Indicators, Feeders, and Fittings; (2) Engineers Sundries, Small Tools, and Stores; (3) Machine Pump and Fire Engine; (4) Turret Clock, &c.; (5) Electric Telegraph, A B C Instruments, Bells, and Apparatus.

J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

HOPKINS, GILKES, & CO.,

LIMITED,

MIDDLESBOROUGH,

SUPPLY GAS & WATER PIPES of EVERY SIZE.

Plain, Turned and Bored, and Coated.

CAST-IRON RETORTS.

Castings for Gas-Works of every description.

EXHAUSTERS.

LONDON OFFICE: 25, LAURENCE POUNTNEY LANE.

IN THE MATTER OF

BRONNER'S GAS-BURNERS.

HENRY GREENE AND SON, 155, Cannon Street, London, Sole Agents for Great Britain, Ireland, and Colonies, of Brönner's Improvements in Gas Lighting, beg to inform the public that on the 13th of January, 1876, Julius Brönner obtained an injunction in the Court of Session, Scotland, against Donald M'Vean, Gas-Fitter, 14, Newton Street, Glasgow, prohibiting him from in any way advertising or offering for sale as Brönner's Burners, any Burner not manufactured by Julius Brönner, or from in any way inducing the public to believe that the said Donald M'Vean sells or keeps for sale Brönner's Burners, manufactured by Julius Brönner, while such is not the case.

Also that on the 9th of November, 1875, he obtained injunction in the same Court, and in the same terms, against R. M. Brechin and Co., 46, North Hanover Street, Edinburgh.

Also that on the 20th of April, 1875, in a suit in Chancery, before Vice-Chancellor Malins, number 1874, B 365, he obtained injunction against another defendant, in the same terms and on similar grounds.

SZERELMEY Liquid Enamel, for Iron-work exposed to the atmosphere, supersedes paint, dries in two hours, absolutely prevents rust, contains no oil, requires no mixing, is ready for use, is laid on like paint, covers new or old iron or wood, old paint, tar, or whitewash, is waterproof, gives a fine polished surface, and costs scarcely one-fourth as much as paint—namely, one halfpenny per square yard. Samples to any address for 12 stamps. Particulars free on application.

SZERELMEY Iron Paint has stood the test of 24 years experience. The gilding on the Victoria Tower of the Houses of Parliament was laid on over it upwards of 20 years ago, and is still in perfect condition.

SZERELMEY Stone Paint thoroughly waterproofs brick and other walls without giving them the appearance of having been painted.

COPIES of Reports on the Szerelmey compositions, by Sir Charles Barry, Sir R. J. Murchison, and Professor Faraday (printed by order of the House of Commons), with other information, may be had on application.

NONE of the Szerelmey compositions contain white or red lead, arsenic, or any other injurious ingredient. When in use and while drying they have a purifying effect on the atmosphere.

SZERELMEY Liquid Enamel.—The cost of the Enamel when laid on is about one halfpenny per square yard. We are now entering orders for execution at any time before the end of March, at £25 per ton, subject to a liberal discount for cash, particulars of which we will send, if asked. A ton measures about 125 gallons, and is ready for use.

SHIPPERS will receive liberal treat- ment at our hands. They will find that our Enamel Paste can be supplied for shipment at a price with which no ordinary paint can compete.

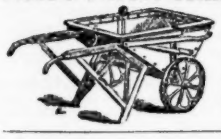
SZERELMEY Debentures.—Investors desirous of subscribing for the remainder are requested to intimate their intention as early as possible. The debentures will be dated Jan. 1, 1876; from that date interest at 8 per cent. per annum (for which coupons are attached) will be paid quarterly. No prospectus will be advertised, but full particulars will be sent in reply to any application addressed to N. C. SZERELMEY AND COMPANY, Limited, 24, City Bank Chambers, Threadneedle Street, LONDON, E.C.

WATER-MAINS.

COTTERILL'S PATENT STEEL TUBE- DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¾ to 3 inches and upwards. They cost less than the ordinary plan.

Apply to CHARLES FORSTER COTTERILL, Cannock, STAFFORD, Patentee.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of
CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & CO., GHENT, will receive immediate attention.

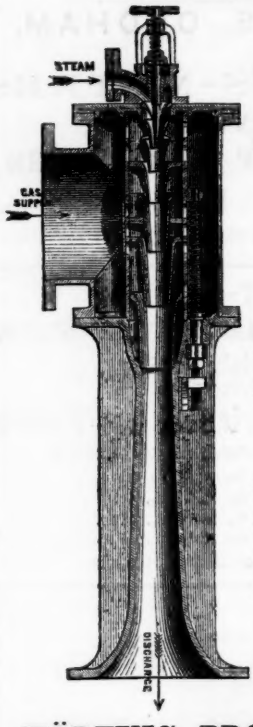
FIRE-CLAY RETORTS.

WILLIAM FRASER,
INVERKEITHING,
Owner of the Works at which Fire-Clay Retorts were first made), can supply
RETORTS, FIRE-BRICKS, &c.,
to any extent.
References can be given to managers of above a hundred Gas-Works whom he supplies.
He ships at Charlestown his
CELEBRATED HALBEATH STEAM COALS,
on Navy List.

JAMES NEWTON & SONS,
(Established 1820,)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.,
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for
GAS AND WATER WORKS.

KÖRTING BROS.,

Steam-Jet Engineers,



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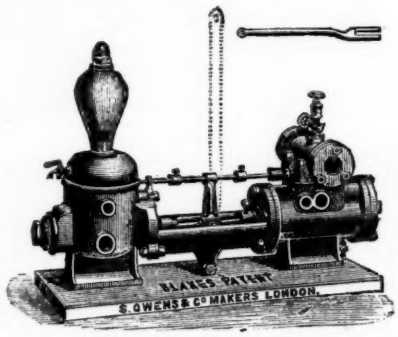

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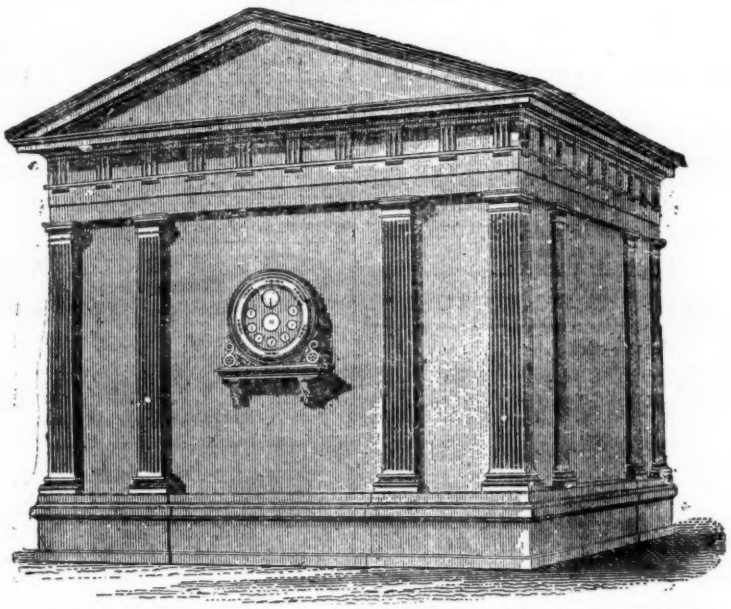

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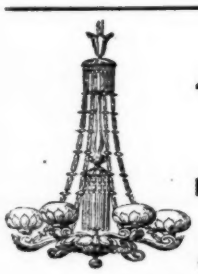

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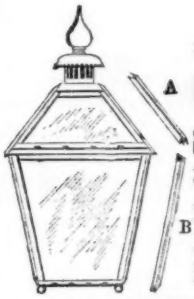

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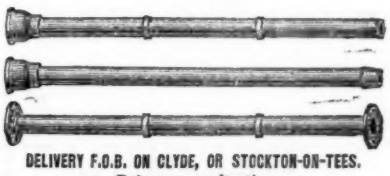

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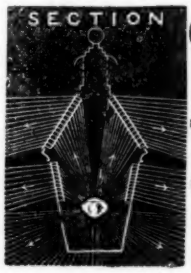

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Cubic feet of Gas yielded per ton . . .	10,050
Illuminating power in sperm candles . .	15·4
Yield of coke per ton of good quality . .	13⅜ cwts.

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Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

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Purified gas per ton of coal in cubic feet (average)	10,775
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This Company request attention to the very superior quality of their Cannel Coals.

1. The following are the practical results given by Dr. Wallace, of Glasgow, of analyses of their Lochore and Capledrae Cannels:—

	Sample worked at Capledrae.	Sample worked at Lochore
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure . .	13,095 cubic feet.	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91	34·83
Value of 1 cubic foot of gas in grains of sperm	780	836
Equivalent of a ton of coal in pounds of sperm candles	1,459	1,404
Durability of 1 cubic foot by 5-inch flame	69 minutes.	71 minutes.
Gravity of the gas (air = 1000)	596	594

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

	Capledrae Waverley.	Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	9,120 cubic feet.	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·62	33·09
Value of 1 cubic foot of gas in grains of sperm	878	794
Equivalent of a ton of coal in pounds of sperm candles	1,145	1,264
Durability of 1 cubic foot of gas by 5-inch flame	80 minutes.	67 minutes.
Gravity of the gas (air = 1000)	677	597

Remarks on the Sample of Capledrae Waverley.—This Coal gives fully 9000 feet of gas of 36½ candles, and is admirably adapted for bringing up the quality of gas made from common coal or inferior qualities of cannel. The tests were made at a rather high temperature, this being one of the coals that stand a very high heat without serious diminution of the illuminating power of the gas The coke contains 60 per cent. of ash, and is therefore almost valueless, but the proportion of sulphur is very moderate.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

Applications for full Copies of Analyses and Prices may be made to the Company.

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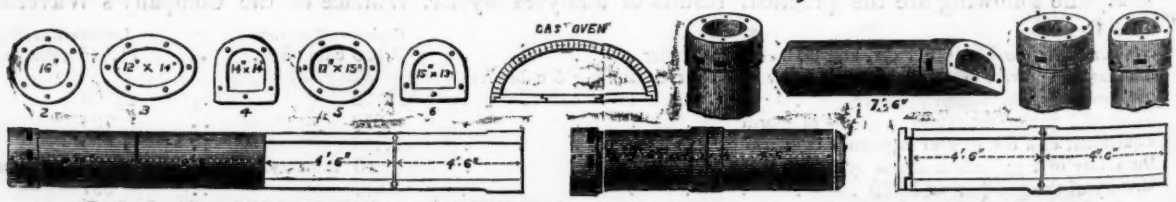

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